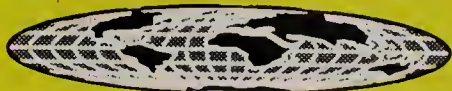


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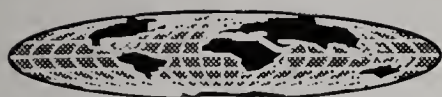
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WRS-98-3
July 1998

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CHINA

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Summary

China's Economy Slows; Livestock Sector Posts Long-Term Growth

The Asian financial crisis is pressuring China's economic growth this year. China's labor-intensive export goods are meeting stiff competition from other Asian economies. After averaging 11 percent annually during the past 5 years, China's GDP is expected to drop below the 8-percent target set by the government for 1998. So far, China has resisted pressure to devalue its currency and is investing in its infrastructure sector to stimulate domestic demand.

China's new premier, Zhu Rongji, expects the on-going reform of the government-controlled grain marketing system will improve efficiency, decrease staff, and separate policy functions from commercial operations. However, implementation of the reforms, triggered in part by the grains system's increasing drain on government revenues, will strengthen government control over the grain economy and will likely reduce the operation of open markets.

China is forecast to harvest an average-size wheat crop in 1998. Recently, China's State Statistical Bureau announced a much smaller summer grain harvest this year, down more than 14 million tons from the previous year. The "governor's grain bag responsibility system" continues to use economic incentives and administrative pressures to push farmers to grow wheat and rice even though stocks are high and prices are low. Farmers harvested record wheat and rice crops in 1997. In 1997/98 China imported only 2 million tons of wheat, the smallest amount since 1961. Rice exports from the 1997 crop are forecast to rise to 2.5 million tons, the most since 1973.

China's agricultural authorities expect the corn crop for 1998/99 will increase to an estimated 122 million tons. Output fell from a record 127 million tons in 1996 to 104 million in 1997, largely due to drought. But even with lower output, China likely will be able to export 6 million tons of corn in 1997/98. Overall, the large grain crops in 1996 and 1997 boosted state-controlled stocks of all grains to over 200 million tons.

Cotton output for 1998/99 likely will be down slightly compared with 1997/98. The government has reduced its support price for cotton and ended government-determined prices to mills.

China is forecast to import 4.3 million tons of soybean meal in 1997/98, making it the world's largest soybean meal import market. The country is also the world's largest market for

soybean oil, with imports rising to an estimated 2 million tons in 1997/98.

China is the world's largest producer and consumer of most livestock meat products. But trade accounts for very small share of the livestock economy. Government policies have severely limited the exposure to world markets. In the past decade, a strategy of grain self-sufficiency limited the growth of domestic livestock production, while a strategy of meat self-sufficiency restricted imports of livestock products.

Of China's total animal protein consumption in 1995, pork accounted 50 percent, eggs 17 percent, aquatic products 16 percent, poultry meat 12 percent, beef 3 percent, mutton and goat meat 2 percent, and milk 0.2 percent.

While pork is by far the most important product in China's livestock sector, its importance is declining. Constraints on the feed grain supply are likely to slow future growth of China's pork output. The structure of pork production has been changing as output has gradually shifted from individual farm households using traditional technology to specialized livestock producing households and commercial firms using modern technology. The largest potential future gains in feeding efficiency are still to be found in the pork sector.

Poultry production and consumption increased rapidly from 1980 to 1996. Production growth was stimulated not only by general market-oriented policy reforms, but also by direct government support in such things as specialized poultry breeding operations. Government plans call for continued support of the poultry industry.

Even though beef production rose sixfold between 1980 and 1996, beef still accounts for only a small share of China's total meat consumption. Although the expansion of more efficient feeding practices is expected to boost production in the coming decade, beef output is likely to increase more slowly than in the past because of consumer preferences, rising prices, and slower income growth.

Mutton and goat meat output more than quadrupled from 1980 to 1996. In the coming decade, government policies that support more efficient feeding using crop residues can be expected to continue to stimulate production in intensively cropped areas.

Dairy output expanded from 1.4 million tons in 1980 to 7.4 million in 1996. Tightening feed grain supplies over the next decade are likely to reduce the rate of growth.

Aquatic product output accounted for the most rapid growth among all animal protein products, making China the world's largest producer. But per capita at-home consumption is still low. Prospects for the coming decade are mixed. While the government has invested heavily in equipment to increase the ocean catch, world fish resources appear to be declining and traditional fishing nations are becoming increasingly conscious of overfishing and damage to marine ecosystems. And although authorities would like to expand inland production, water shortages and environmental concerns will constrain rapid growth.

Researchers have observed that per capita meat availability as measured by government production and population statistics is larger than per capita meat consumption as measured by urban and rural household income and expenditure surveys. China's State Statistical Bureau, which recently completed its first census of agriculture, confirmed the over-reporting. A number of articles in this report touch briefly on the issue. In addition, ERS plans to address the topic in a Staff Report, *A Review of China's Meat Production Statistics: An Estimation Methodology and an Analysis of the Implications for Trade*, to be published later this year.

Asian Financial Crisis Puts Pressure on China's Economy

The Asian financial crisis is hampering China's economic growth. Following currency devaluations in other Asian countries, competition is mounting in export markets for labor-intensive manufactured goods. China has resisted devaluing its currency and has tried to stimulate domestic demand by investing in infrastructure. [Xinshen Diao, 202-694-5219 and Suchada Langley, 202-694-5227]

Growth Rate Is Expected To Fall in 1998

While turmoil in Asian financial markets dominated headlines in the summer of 1997, China's economy was quite stable, though its growth rate continued to decline gradually from 9.7 percent in 1996 to 8.8 percent in 1997. China's government projects GDP growth at 8 percent in 1998, and the World Bank projects it at 7.5 percent. Both projections are below the 11-percent annual average achieved over the last 5 years.

China still managed to maintain a sound trade sector in 1997, with a 20.9-percent increase in exports and a 2.5-percent increase in imports from the previous year. This trade allowed it to build a \$40.3-billion trade surplus in 1997, increasing foreign exchange reserves to \$139 billion.

Foreign capital inflow commitments of \$62 billion in 1997 were down by 24.2 percent, but the actual foreign capital inflows increased 15.7 percent to \$64 billion. Foreign direct investment increased 8.5 percent to \$45.3 billion.

Growth of domestic demand was sluggish, which helped keep the inflation rate low. The consumer goods price index rose only 0.8 percent, as shown in table 1.

Problems in China's Banking System

The Asian financial crisis and the expected slowdown in China's economy have increased pressure on its leaders to speed up reform of state-owned enterprises and the banking system. By international banking standards, China's banks are among the poorest performers in the world. The authorities in Beijing estimate that about 20 percent of bank loans are nonperforming (7). In comparison, 11-20 percent of Korea's bank loans and 15-20 percent of Thailand's were nonperforming at the end of September 1997 (8). However, the classification of loan quality is quite different in China from that in other countries. Given the very short maturity for most industrial loans in China (5-6 months), the central bank officials believe that only about 7 percent should be classified as actually nonrecoverable (5).

Dramatic economic expansion in 1992-93 is a major reason for the rapid expansion in China's commercial bank credits. The result was an overheated economy with two-digit inflation in 1993-94. Since late 1993, China's central leaders have struggled to control inflation using a so-called "soft landing" policy. The authorities have combined administrative controls (such as moderate credit restraints, caps on new investment spending, crackdowns on unauthorized lending, and restrictions on speculative activities), with some market-based measures (e.g., inflation-indexed interest subsidies for long-term saving deposits). The tight credit policies played an important role in curbing inflation and moderating economic growth. However, the shortage of credit caused many investment projects to be stopped before completion, increasing the number of nonperforming bank loans. Also, the government required banks to pay a high interest rate on long-term saving deposits. The requirement increased the fragility of the banking system.

In March 1998, the government announced that its goal for banking system reforms is to establish a modern financial system in accordance with prevailing international standards (9). The reform strategy includes commercializing China's state banks and providing them greater autonomy in lending decisions. Commercial banks will be allowed to operate independently, and previous lending quotas will be abolished.

Table 1--China's macroeconomic indicators, 1996-97

Indicator	Units	1996	1997
Population	Millions	1,223.9	1,236.3
GDP growth	Percent	9.7	8.8
GDP (1)	US\$ billion	816.8	na
Change in CPI	Percent	6.1	0.8
Currency in circulation	US\$ billion	106.0	na
Total state revenue	RMB billion	736.6	na
Total state expenditure	RMB billion	791.4	na
State budget deficit	RMB billion	54.8	na
Fixed asset investment	US\$ billion	285.0	na
Exports	US\$ billion	151.1	182.7
Imports	US\$ billion	138.8	142.4

na = Not available.

(1) GDP is in current prices.

Sources: China State Statistical Bureau, *China Statistical Yearbook*, 1997; China Monthly Statistics, December and January, 1998. China currency is Ren Min Bi (RMB), also called yuan.

Close Linkages Between China's State-Owned Enterprises and Banks

The poor performance of the banking system is closely related to the poor performance of the state-owned enterprise sector. Though China's reform program has been underway for more than 10 years, it has not yet significantly affected large state-owned enterprises. While the state-owned enterprise sector accounts for a shrinking share of GDP, it continues to absorb a disproportionately large share of bank credits—around two-thirds. With the economic slowdown, excess capacity and rising inventories have further contributed to the deterioration of state-owned enterprises. Capacity utilization was below 60 percent in half of the industries covered in a nationwide decennial survey completed in 1997 (2). Over 40 percent of state industrial enterprises were in the red during much of 1995 and 1996; another 30 percent were barely profitable; and only 20 percent were securely in the black.

State enterprise reform was moved to the top of the agenda years ago, but progress has been slow. This overstuffed sector remains a major employer of urban labor. Many enterprises also provide a broad range of social services, such as housing, education, and medical care. The threats to social stability caused by the high unemployment resulting from the economic slowdown forced China's government to slow down its reform of state-owned enterprises in mid-1998. Small enterprises were promised much more flexible ownership and management in early 1998, but a new decree issued in June banned the so-called "random" sale of small state enterprises. It is clear that ballooning unemployment has made the reform of state-owned enterprises and the separation of social functions from them far more difficult than what the central government expected.

Similarities and Dissimilarities With Other Asian Countries

With currency devaluation in other Asian countries, competition is mounting in markets for labor-intensive manufactures, a sector in which China has a comparative advantage. Until recently, China experienced rapid economic growth similar to its Asian neighbors—Indonesia, Thailand and South Korea, countries now at the center of the Asian financial crisis. As the turmoil in Asian financial markets continues, there is increasing concern about the stability of China's economy and its currency.

China maintains a fixed foreign exchange rate and limited currency convertibility. Similar to other troubled Asian countries prior to the financial crisis, China has a fixed foreign exchange rate policy. Starting in the late 1980s, market-determined exchange rates were permitted alongside the overvalued fixed official rates (the so called two-tiered exchange rate system). While the overvalued official exchange rates distorted trade conducted by state trading

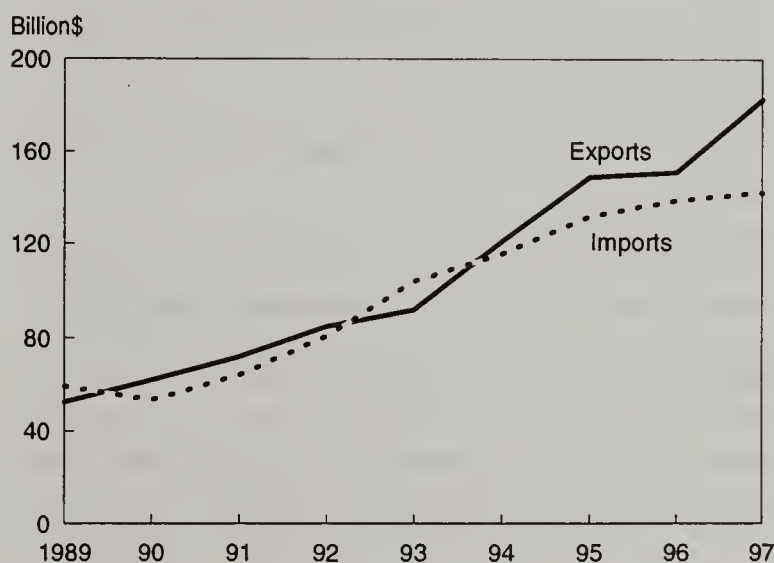
companies, the share of transactions made at market-determined rates gradually increased (11).

China's trade depends on its own policies and its relative competitiveness with neighboring countries. With roughly 80 percent of all trade transactions taking place at the market exchange rate, China's government decided, in 1994, to unify the two exchange rates by devaluating the official rate—roughly 5.8 yuan to one U.S. dollar at that time—by about one-third to the market rate of 8.7 RMB to the dollar. The 1994 devaluation improved China's competitiveness in markets for labor-intensive commodities, causing its exports to expand further (fig. 1 and fig. 2). Exports had started to accelerate in 1993, prior to the devaluation, due to major economic reforms. The restrictive policies to cool down China's economy in 1995 curbed the growth of exports and imports. China's exports resumed their rapid growth in 1997, as other Asian countries' exports slowed down.

China did not give up its fixed exchange rate policy after the 1994 devaluation: the new rate is still pegged to the U.S. dollar. In addition, some restrictions on currency convertibility are still in place. For example, foreigners, including foreign investors and foreign banks, cannot freely purchase China's domestic currency. China's citizens, investors, and commercial banks cannot freely purchase foreign currencies to make financial investments. The purpose of such constraints is to limit foreign portfolio investment, e.g., investment in China's domestic stock market or in other financial assets. At the same time, China has encouraged foreign direct investment by using various incentives, such as income tax and import tariff reductions, as well as full currency convertibility for the trade- and production-related activities of foreign-funded enterprises.

The restrictions on China's capital market and limited currency convertibility ensure that a financial crisis directly trig-

Figure 1
China's Total Exports and Imports

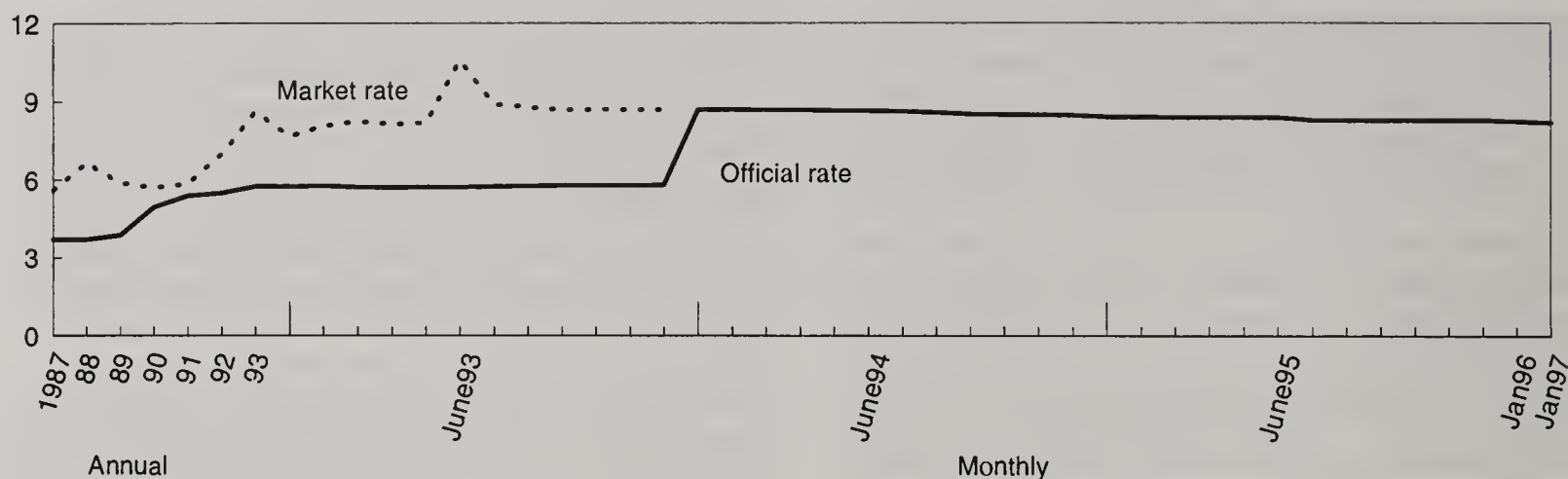


Source: China State Statistical Bureau.

Figure 2

China's Exchange Rates

RMB/US\$



Source: IMF, International Finance Statistics, various issues.

gered by foreign investors' speculation—as occurred in other Asian countries—is almost impossible in China. However, as China attracted huge foreign direct investments in the last 5 to 10 years, its economy became vulnerable to disruptions in foreign capital flows. That is, when China's economic growth slows and its production costs rise relative to its neighbors, foreign capital inflows are expected to fall. Furthermore, much of the foreign capital flowing into China originated in Hong Kong, Japan, and Korea. When these countries and the region were hurt by the Asian financial crisis, their contributions of capital to China fell. Foreign direct investment in China is expected to decline by \$15 billion in 1998 (4), falling to two-thirds of its 1997 level. Foreign direct investment has become a major force in supporting China's efforts to develop an export-oriented industry during the last 10 years. A significant drop in foreign direct investment will further dampen China's economic growth.

China Faces Broader Problems Than Currency Devaluation in 1998/99

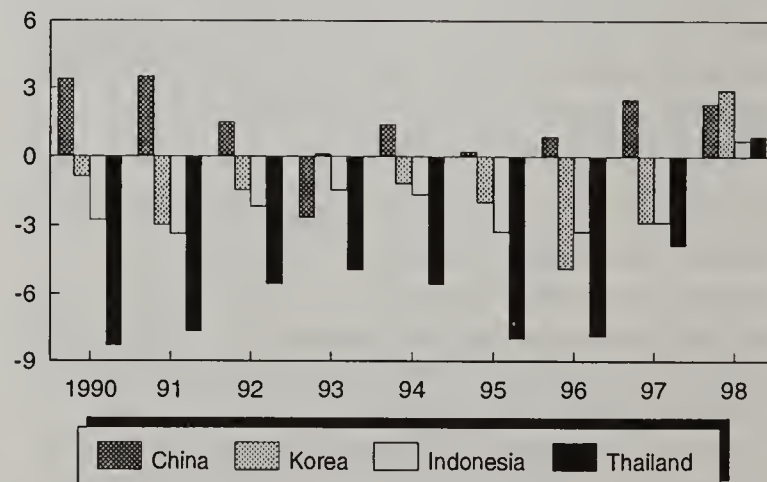
When the turmoil in Asian financial markets began, there was increasing concern about the stability of China's economy and its currency. However, in contrast to its troubled neighbors, China appears to have a sound external sector, as evidenced by current account surpluses (fig.3). China holds large foreign reserves. Its short-term debt in 1996 was equivalent to only 13 percent of total foreign reserves (fig. 4). While China attracted a major share of the total foreign direct investment flowing into developing countries, the ratio of its foreign debt to GDP is low, about 1.5 percent in 1996. In addition, the ratio of foreign banks' liabilities to China's GDP was a low 5.6 percent at the end of 1996. This compares with 23.3, 12.8, and 9 percent in Thailand, South Korea, and Indonesia, respectively (6) and (3).

Mainland China's exports are closely linked to Hong Kong's economy: Due to sharpened competition from low-wage Asian countries with depreciated currencies, China's exports are expected to fall. These negative effects are likely to be aggravated by changes in Hong Kong's economy. After Hong Kong officially became a Special Administrative Region (SAR) of the People's Republic of China, mainland China still treated trade with Hong Kong as international trade. With about a 20- to 25-percent market share, Hong Kong remains the largest market for China's exports. About 75-80 percent of Hong Kong's imports, including those from mainland China, are re-exported to the rest of the world. But Hong Kong's economy was badly hurt by the Asian crisis in late 1997 and early 1998, after it sharply raised interest rates in November 1997 to prevent depreciation of its dollar. The high interest rates are expected to lead to a serious slowdown in Hong Kong's economy, reducing both China's exports to Hong Kong and Hong Kong's investments in mainland China.

Figure 3

Current Account Balances

Percent of GDP

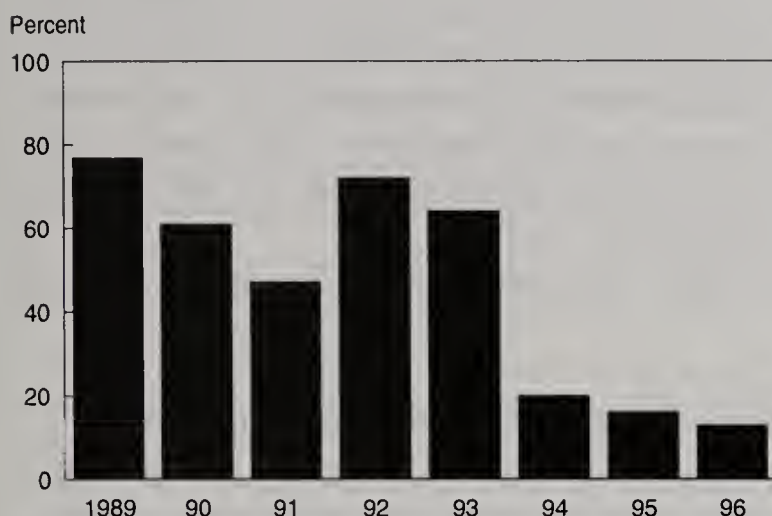


1998 forecast.

Source: IMF; Oxford Economics (1998).

Figure 4

China's Share of Short-Term Foreign Debt in Total Foreign Reserves



Source: China State Statistical Bureau.

Unemployment is high and the domestic market is weak:

China also faces the severe challenge of raising employment by stimulating domestic demand. Unable to find markets for all of their products, many state firms have sent workers home and sharply reduced wages. Although urban unemployment is officially only 3 percent, the number of workers who are currently laid off but still affiliated with state enterprises (and hence technically employed) amounts to about 7 to 10 percent of the urban labor force. In some large industrial metropolises, such as Shanghai and major northeastern cities, the true unemployment rate probably is considerably higher.

There is no formal social welfare system for unemployment compensation in more than 90 percent of China's cities. Only one-third of China's cities have announced the lowest living standard for citizens. Rising unemployment and delays in wage payments have led increasingly to strikes and worker demonstrations. According to a recent survey of 20,000 "xia gang" (an administrative label for workers sent home but not officially discharged), only 1.2 percent had obtained social welfare.

The domestic market may be further weakened in 1998 by reforms in the urban housing system and by massive cut-backs in the civil services. The central government has announced plans to privatize all publicly owned residences in cities. City dwellers must either move out or purchase their apartment units, previously occupied at a very low rent. To meet this requirement, families have to save money and hence reduce their consumption. Furthermore, the announced streamlining of the government administrative system will cut the size of central and local government offices in half, leaving more than a half million officials to find jobs elsewhere within the next 3 years. With such uncertainties, consumption expenditures are expected to fall significantly.

China's goal is a stable RMB: China's economy is facing challenges in both the domestic and export markets. Although China's official goal is a stable RMB, many people still wonder whether the desire to maintain economic growth and international competitiveness will overcome China's reluctance to devalue its currency. Currency devaluation would stimulate China's exports but increase import costs, which would discourage domestic demand by raising prices for imported goods and domestic goods produced with imported intermediates. Without currency devaluation, China could lose some of its export competitiveness. With currency devaluation, domestic demand would be curbed, further impeding economic growth. More production capacity would be idled, adding to the problems of firms already in difficulty.

Faced with such policy dilemmas, China's government is choosing to stimulate domestic demand by increasing investment and reducing interest rates. There are, of course, many other considerations, including political ones, impelling the government to resist currency devaluation. Whether domestic markets can replace export markets as the major source of economic growth in the coming years is a challenge facing China.

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Agricultural Policies in 1998: Stability and Change

China's leaders continue to allocate significant financial and administrative resources to bolster grain production. Food grain security issues remain high on the political agenda. China's new Premier has initiated a reform to reduce the central government's financial exposure, downsize the grain management bureaucracy, and improve grain marketing efficiency. While markets have become increasingly important in China's grain economy, these recent policies and reforms may restrict their development. [Frederick W. Crook 202-694-5217]

Macro Direction for 1998

For 1998, China's new cabinet aims to address macroeconomic issues related to the Asian financial and trade crisis, sluggish domestic spending, reforming rules governing state-owned enterprises, and urban unemployment (see macroeconomy section above). The primary agricultural production targets for 1998 are shown in table 2.

New Government Leadership Team

In March, the National People's Congress endorsed Zhu Rongji as Premier and installed 4 Vice Premiers, 5 State Councilors and 29 Ministers. Vice Premier Wen Jianbao will oversee agricultural affairs. Mr. Chen Yaobang, the new Minister of Agriculture, was formerly the Minister of Forestry, and Mr. Niu Maosheng was retained as Minister of Water Conservancy.

The new leaders have vowed to separate government function from direct involvement in production and management of enterprises and increase the efficiency of government organizations. Government units are being restructured by eliminating or merging some departments that were functioning as profit-making entities. The number of State Council departments was reduced to 29 from 44, while the number of government employees will be reduced by half. Reforms will be carried out in the grain distribution, investment, financial, housing, and medical care systems.

Basic Agricultural Policies Won't Change

For 1998, the new cabinet's basic strategy is to make few changes in the agricultural sector while focusing attention on what it deems the more urgent reforms required in the urban sector.

The land tenure system based on the land contract system will not change. Farmland will continue to be owned by village collectives, which will continue to extend land contracts to individual farm households for 15, 30, and in some cases 50 years.

The government will continue efforts to reduce the tax burden on rural households. The government has stated that the tax burden on farm households should not exceed 5 percent of net farm income. However, if this is correctly implemented, it would reduce government revenues. The new cabinet hopes that the savings from downsizing government units can be used to offset the lost revenues.

The new cabinet will continue to place great emphasis on food security issues embodied in the governor's grain bag responsibility system. That policy greatly boosted domestic grain production in 1995, 1996, and 1997, resulting in increased grain exports, reduced grain imports, large and growing grain stocks, and falling grain prices. To stimulate grain production in 1998, the government plans to continue using protection prices (support prices) that are set by the central government at 10 percent below the government fixed quota price. The fixed quota price is the amount that farmers are paid for delivering set quantities of wheat, rice, corn, and soybeans to government-owned grain purchase stations.

The government has purchased millions of tons of grain with the support price system and placed the grain in storage bins. The use of support prices and storage costs for perhaps close to 200 million tons of grain (according to China's officials) has become a great burden on central government revenues, but these costs are seen as an acceptable trade-off to unstable food grain prices and possible shortages in urban areas.

Table 2--Production targets for 1998

Item	1997	1998
	reported	targets
Million tons		
Total grain	492.5	492.5
Cotton	4.3	4.0
Oilseed crops	21.5	23.0
Sugar crops	93.6	87.0
Meat	53.5	56.5
Aquatic products	35.6	38.0

Source: (1).

For 1998, the government is looking for ways to improve the quality of early rice and to handle northeastern high-moisture corn. Farmers have difficulties selling these low-quality crops, and government granaries have had to purchase a large portion of these crops. Government research institutes are being asked to develop early rice varieties that have better consumption characteristics. Corn breeders will be asked to develop improved varieties, and measures will be taken to improve the handling of high-moisture corn. The government also intends to promote vegetable, fruit, meat, and food processing to increase the value of products and to seek export markets for these goods.

In 1998 the government will continue its policies of investing in agricultural science and technology. Investments will be made to upgrade seed breeding and water conservation projects. Water shortages and higher water costs are driving farmers and government units to invest more in water saving technologies.

Reform of China's Grain System

China's Premier, Zhu Rongji, attended meetings to reform the grain marketing system in China's Northeast corn belt in March and delivered an address stating that the current system "...harmed the interests of farmers," and noted that "the system has failed to meet the need for development of the socialist market economy." These fairly harsh words and views about the grain system indicate a strong resolve by the Premier to initiate action. Part of the reason for this dissatisfaction is that the "grain system" has become increasingly expensive. At the meetings, Premier Zhu warned that "The ever-increasing subsidies have become a nearly unbearable burden for the fiscal budget." Over the last 15 years the government increased the fixed quota grain price to motivate farmers to maintain and increase grain production. But these price increases also meant the amount of bank loans to purchase grains increased from 47.2 billion RMB in 1984, to 140.9 billion in 1990, and 226.3 billion in 1994. A second report noted that losses by state-owned grain enterprises totaled 19.7 billion RMB in China's grain year April 1, 1995 to March 31, 1996; 40 billion in 1996/97; and over 100 billion in 1997/98.

Zhu charged that the Grain Bureaus (*Liangshi bu*): (1) were slow to change management mechanisms; (2) had surplus staff; (3) were poorly managed; and (4) diverted funds designated for grain purchases into other uses. The Grain Bureaus at provincial, prefecture, county, and township levels manage China's grain purchase and distribution system. County Grain Bureaus manage subordinate grain stations (*liang zhan*), grain depots, grain mills, transportation teams, and retail grain stores (*liang dian*).

The grain system is at the vortex of many deeply held tenets such as the primacy of urban secure food grain rations, state-owned enterprises, food grain security (the

governor's grain bag responsibility system), control over grain imports and exports, and grain stocks to insure against famine and disorder. In 1985-86 and again in 1993-94 the central government tried to reform the grain system, but little was accomplished because leaders backed away from reforms when prices fluctuated. Plans for the current reform of the grain purchase system were laid as far back as 1995, but implementation among the various provinces has been uneven.

Newly-installed Premier Zhu announced in his first press conference that he intended to initiate five reforms, and at the top of the list was reform of the "grain system." Subsequent statements suggest that the reform will begin in summer 1998. As with many reforms in China the message of the reform was encapsulated in a six Chinese character phrase (four separations, one perfection): *si-fen-kai, yi-wan-shan*. The grain system reforms are:

- Separate policy functions in the grain system from commercial functions. Current Grain Bureaus now handle both operations. For example, they purchase grain on their own account to pursue profits, but they also purchase grain from farmers at fixed quota prices, store government-owned grain, mill grain, and retail some grain at fixed prices.
- Separate central government-owned grain stocks from commercially held stocks. The State Administration for Grain Reserves (SAGR), formerly the Ministry of Food, was connected to the Ministry of Internal Trade in the last government reorganization. In the new reorganization plan, the SAGR will be placed under the State Development and Planning Commission. The current system needs to be reformed because even though it held large grain stocks, it was ill-suited to manipulate grain stocks to meet quantity, quality, grain mix, regional distribution, and market stabilization requirements.
- Separate duties of the central government in stabilizing grain markets from market stabilization duties of local governments. The central government is scheduled to keep overall control of the grain situation, including control of grain imports, exports, and state owned stocks. Extant provincial, prefecture, and county Grain Bureaus will be separated into commercial and policy entities. We believe that the local grain stations (below the county level) will become commercial grain companies through auction, leasing, shareholding, and joint stockholding. Local governments will merge the policy portions of the old Grain Bureaus into "trade or commercial" bureaus. Local governments are scheduled to be responsible for grain production and circulation within their respective administrative boundaries.
- Separate old overdue bank debts from new debts.
- Perfect a system that will allow supply and demand elements within markets to set grain prices.

Government authorities have contradictory objectives. On the one hand they want markets to develop, but on the other they want price stability, fixed prices, and limits on who can participate in grain trade.

Grain Bureaus that have policy functions will be expected to: (1) set fixed quota grain purchase prices for wheat, rice, corn, and soybeans; (2) set support prices for these grains; and (3) set ceiling prices for grain retail sales.

The Grain Bureaus want state-owned grain enterprises to: (1) participate in grain markets; (2) practice independent accounting with responsibility for their own profit or loss; (3) reduce operating costs; (4) enhance competitiveness; and (5) become self-regulating and self-managed.

The general plan is for drastic reductions in the numbers of workers employed in the government-owned "Grain Bureau" system. There are at least three reasons underlying overstaffing in Grain Bureau units. First, China's military system pressured the Grain Bureaus to hire demobilized soldiers because entities in the Grain Bureau are state-owned enterprises. Second, college graduates and graduates from technical secondary schools are assigned jobs in the Grain Bureaus because they are state-owned enterprises. Third, persons already employed in the Grain Bureau system promote the hiring of friends, relatives, and job-seeking children of Grain Bureau employees. Currently some 4.1 million workers are employed in the system, and the problem is how to deal with laid-off workers and the millions of workers who have retired from the system over the last 20 years.

In the past 20 years markets have become increasingly important in China's economy. But the current reform may actually be a step backward toward more government control over China's grain system. Whether the reform increases government control or promotes development of increasingly competitive grain markets depends in great part on how local cadres actually implement the reform system.

From what we can tell thus far, the reform works against the development of grain markets. Authorities specify that farmers can only sell their grain to state-owned grain stations, and after fulfilling their government procurement quotas they are permitted to sell either to state-owned grain stations or in local open markets. Government grain companies will be the only entities that can purchase grain from local grain stations. Private grain companies, feed and food processing mills, and state-owned enterprises are not permitted to purchase grains directly from farmers and are not permitted to purchase grains in local open markets. These entities can only buy grain in wholesale markets at the county level and above.

In the past 10 years, the functioning of local grain markets provided government authorities with valuable price information to manage the grain economy. For example, market prices helped officials understand how China's domestic grain prices compared with international prices, and they helped them set appropriate fixed quota and support prices. If the functioning of local grain markets is impaired, authorities will be increasingly hard pressed to manage their grain economy.

The way these reforms are implemented may have important implications for international grain trade. Production, internal grain trade, stockholding, and grain exports and imports may be affected. The reforms certainly should be a matter of great interest to grain producers and exporters in the United States.

Sources:

1. "Figures from Draft Plan for 1998 Development," Xinhua in English, March 7, 1998; in FBIS, No.66, March 7, 1998.
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Food Grains: Wheat and Rice

[Frederick W. Crook 202-694-5217]

Average Wheat Crop Expected in 1998

The record wheat crop in 1997 boosted domestic supplies above demand, resulting in stock building and falling free market prices for wheat. In a market system, these signals would encourage farmers to reduce wheat plantings. But in China, food security issues and the current "governor's grain bag responsibility system" provide an environment in which farmers will be pressured to maintain wheat area in 1998.

Wheat yields may dip slightly in 1998 because of dry conditions during planting and because of reduced input use. Farmers had difficulties selling their grain crops in 1997 and early 1998, and therefore had insufficient funds to purchase inputs. Currently, a crop of 118 million tons is forecast.

Record Wheat Harvest in 1997

Farmers reaped a record 123.3-million-ton wheat crop in 1997, up 11.8 percent from 1996. Sown area rose 447,000 hectares to 30 million, an increase of 1.5 percent. Yields rose 10.1 percent from 3.73 tons per hectare in 1996 to 4.1 in 1997.

Wheat Imports Down

In marketing year 1995/96 China's wheat imports totaled 12.5 million tons. But food security issues and the implementation of the governor's grain bag responsibility system in 1995-1997 boosted domestic production. Stocks increased and state planners reduced wheat imports to 2.7 million tons in 1996/97 and an estimated 2.0 million in 1997/98. Imports for 1998/99 are forecast to remain at 2.0 million. China does not publish reports on stocks by type of grain, but USDA estimates that wheat stocks increased in 1997 and the total quantity was high.

Smaller Rice Crop Forecast for 1998

Provincial and county administrators are expected to implement the government's grain policy for 1998. Provinces such as Hubei with large rice stocks will encourage farmers to plant higher-quality rice varieties that have a better chance of being

Table 3--China's wheat production, trade, and stocks, 1996/97-1998/99

	1996/97	1997/98	1998/99
	Million tons		
Production	110.6	123.3	118.0
Imports	2.7	2.0	2.0
Exports	0.8	0.7	0.7
Stocks	24.2	33.8	37.1

Source: USDA, P S and D, June 1998.

Table 4--China's rice production, trade, and stocks, 1996/97-1998/99

	1996/97	1997/98	1998/99
	Million tons		
Production (paddy)	195.1	200.0	na
Production (milled)	136.6	140.0	na
Imports	0.3	0.4	na
Exports	0.9	2.5	na
Stocks	25.6	27.5	na

na = Not available.

Source: USDA, P S and D, June 1998.

marketed through both the government and private rice distribution systems. Provinces such as Guangdong and Guangxi, which produce early crop indica variety rice, plan to develop higher-quality varieties. Early crop indica has a low table quality, and consumers tend to avoid purchasing it; hence it ends up in government stocks to meet food security requirements. It is estimated that a large portion of rice in government stocks is early crop indica. Some rice-producing provinces such as Hunan that also are short of corn for livestock feed intend to promote the planting of corn in rice paddies. Rice yields and area for 1998 are forecast to be up slightly from 1997.

Record Rice Crop in 1997

In 1997 China had a record rice crop of 200 million tons (paddy basis) and 140.5 million tons milled, up 2.9 percent from 1996. Yields rose 1.7 percent and area was up 1.1 percent to an estimated 31.8 million hectares.

Record Grain Stocks

In 1993-95 total government grain stocks (wheat, rice, corn, etc.) were reported to be around 120 million tons. But with record crops in 1996 and 1997, stocks were increased and China's officials now concede that they have record grain stocks, around 200 million tons. On-farm stocks are also reported to be high (see China Report WRS-96-2, pp. 35-39 for details). Stocks of both wheat and rice are estimated to have increased during the year.

References

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"Wheat Prices on PRC Market Thought Likely to Increase," Beijing, Xinhua, December 31, 1997; in FBIS, No. 365, Dec. 31, 1997.

Feed Grains

[Frederick W. Crook 202-694-5217]

Large Corn Crop Forecast for 1998

China's agricultural authorities expect the 1998 corn crop will increase 4-5 percent from the 1997 crop to about 110 million tons. Area sown likely will remain about the same as last year at 23.8 million hectares. In the early months of 1998 domestic corn prices increased, which likely will induce farmers to raise corn and apply inputs to achieve high yields. USDA is forecasting a 1998 corn crop of 122 million tons.

In 1998 some areas in north China and in the northeast may reduce area slightly. But these decreases likely will be offset by provinces short of feed grains such as those in south China. For example, Hunan province is initiating experiments to increase area sown to corn in high yield rice paddy fields.

China's corn stocks for the 1997/98 grain year decreased primarily because demand for feed grains remained high while domestic supplies were reduced by a summer drought that led to stock drawdowns. Analysts in China report that state, local, and commercial reserves fell to 19 percent of total corn consumption.

Corn exports for October/September 1997/1998 are projected at 6 million tons. Even with relatively low government corn stocks (19 percent of consumption), China may have sufficient surpluses to export sizable quantities of corn. The government has tied up large amounts of capital to purchase and store corn, and it knows that the longer the grain is stored, the greater the probability of loss from rodent damage and mildew. Exporting corn may be a way to regain capital, cut operating expenses, and reduce grain losses.

Drought Reduced Corn Crop for 1997

Area sown to corn decreased from 24.5 million hectares in 1996 to 23.8 million in 1997. Falling corn prices in early 1997 induced farmers to reduce area planted to corn. Dry conditions for the late planted corn crop also affected farmers' decisions to plant less corn.

Table 5--China's corn production, trade, and stocks, 1996/97-1998/99

	1996/97	1997/98	1998/99
	Million tons		
Production	127.47	104.30	122.00
Imports	0.08	0.25	0.25
Exports	3.89	6.00	4.00
Stocks	45.00	25.00	22.00

Source: USDA, P S and D, April 1998.

Reduced input use and a long sustained drought in the Northeast and on the North China Plain reduced corn yields from 5.2 tons per hectare in 1996 to 4.39 tons in 1997. Output fell from a record 127 million tons in 1996 to 104.3 million in 1997.

China's calendar year corn exports fell from 8.56 million tons in 1994 to 0.11 million in 1995, 0.16 in 1996, and then rose dramatically to 6.60 million tons in 1997. Calendar year imports also fluctuated greatly, rising from 0.01 million in 1994 to 5.18 million in 1995, falling to 0.44 in 1996, and almost no imports in 1997. The implementation of the "governor's grain bag responsibility system" which stressed self-sufficiency and food security goals, was primarily responsible for the dramatic fluctuations in trends in the corn trade (see section on Agricultural Policies).

In the last 3 years, authorities announced a goal of 95 percent grain self-sufficiency, which they fulfilled: 1995—96.7 self-sufficiency rate; 1996 and 1997—99.9 self-sufficiency rates. News articles in spring 1998 suggest authorities are discussing a 90-percent self-sufficiency rate for the year 2030.

Wheat and Rice in Feed

China's farmers may be using more wheat for feed than previously thought. A recent news article from China reported that about 20 percent of Shandong's wheat crop (over 4 million tons) is fed to livestock. If farmers in other major wheat-producing provinces such as Henan and Hebei also feed wheat in similar fashion, total feed wheat use for 1997 may be larger than currently estimated in USDA balance sheets.

Farmers in southern China are using some early crop rice as feed. While output of this crop has been falling since the record 53.3 million tons in 1984, production in 1997 reached 46 million tons, up 4.5 percent from 1996. Consumers discount the early crop as a table rice because of its undesirable taste and therefore this rice ends up in government stocks. A large portion of the 5 percent of total rice consumption used for feed comes from the early crop.

Reference

"Animal Husbandry Helps Agricultural Growth in Shandong," Beijing Xinhua, December 11, 1997; in FBIS, No. 345, December 11, 1997.

Policy Changes for Cotton

A 300,000-ton cotton export tender in April 1998 signaled the likelihood of China's first significant cotton exports since 1993/94. This export tender follows a series of policy initiatives begun last fall to curtail imports, and roughly coincided with two significant changes in price policy: an unusual decision to cut the officially guaranteed cotton price to farmers, and the end of officially determined prices to textile mills. Equally unusual was the decision to reveal the size of the cotton stocks held in China's State Reserve, which the State Development Planning Commission said is equivalent to nearly half a year's consumption, or more than 2 million tons.

Official USDA data have shown China's total cotton stocks rising about 2 million tons between 1993/94 and 1997/98, to 3.3 million tons, or 71 percent of use. China's officials in press reports have presented data that suggest the USDA estimate is far more correct than many had previously suggested.

Production and Consumption in 1998/99

Official statements from China have suggested that a crop of 4.0-4.6 million tons is likely in 1998/99, compared with 4.6 million tons in 1997/98. Two factors favoring a smaller crop are the decline in procurement prices and the unusually favorable weather in China's southern cotton-growing regions in 1997/98. Qualitative analysis of press reports indicates that incidents of flooding were far fewer or less dramatic during the 1997/98 growing season than in the preceding few years, and harvest rains were unusually light. While yields are particularly difficult to forecast for China, a repeat of 1997/98's record high may not be attainable.

The impact of crop prices on cotton production is not as clear. While procurement prices outside of Xinjiang are to fall as much as 12 percent from the official 1997/98 level, prices of competing crops may be down even more. China has built stocks of several agricultural commodities, and has indicated a willingness to accept lower grain production in the coming year. The cotton procurement price in Xinjiang can fall more than 12 percent, but Xinjiang's irrigation capacity continues to grow and competing, lower valued crops might not be profitable to ship to eastern markets. For all regions, the horticultural alternative to grains and cotton may be weaker during 1998 because of slowing economic growth, and rising unemployment may make cotton's labor-intensity less of an impediment than it was earlier in the 1990s.

Forecasting China's cotton crop is difficult, and the lack of transparency with respect to timeliness of payments, local taxes, local subsidies, administrative guidance, and lending policies means significant factors can be easily overlooked. However, China's cotton crop has been below 4.2 million tons only once during the 1990s, and grain prices were rising strongly at that time.

Consumption of cotton in 1998/99 may be lower than in 1997/98 due to slower economic growth in China and efforts to restructure the textile industry. It is widely accepted that China's 1998 GDP growth will be lower than in 1997. During the second half of the 1980s and the first half of the 1990s, China's cotton consumption was positively correlated with its GDP growth. The negative effects of devaluations by textile trade competitors in Southeast Asia may for a time be offset by the financial disruption in these countries that has been associated with their large currency depreciation.

The seriousness of efforts to restructure the textile industry remains to be seen, since the plan to significantly reduce employment and spindles coincides with the weakening of the economy. With lower domestic cotton prices, increased tax rebates for textile exporting, bounties for destroying spindles, and new government programs for dealing with bad debts, profitability for many mills could improve. Also, the restructuring effort will be focused on the state-owned enterprises (SOEs) rather than the township-village enterprises (TVEs). It is not altogether clear that the government can prevent the TVEs from continuing to add spindles even as the SOEs remove them.

Trade in 1998/99

The introduction of import quotas for 1998 has been widely reported, along with increased enforcement of regulations on the distribution of imported cotton. Joint venture enterprises still have the right to import cotton, but China is unlikely to be a major net importer in 1998/99. While China withdrew its second export tender, it now appears as likely to be a net exporter in 1998/99 as a net importer.

Food security concerns probably increased the value of holding grain and cotton stocks for China's policymakers in the mid-1990s. Several years of bountiful harvests may have raised policymakers' expectations of productive potential and reduced the utility of stocks. If policymakers' interest in stockholding has waned, exporting may appear to be an avenue for adjusting stocks downward.

Oilseeds

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Oilseed Production Up in 1997

Production of oilseeds (soybeans, cottonseed, peanuts, rapeseed, and sunflowerseed) rose from 42.9 million tons in 1996/97 to 44.5 million in 1997/98, an increase of 3.7 percent. China produced 14.7 million tons of soybeans in 1997, up 11 percent from the previous year. (4) Soybean acreage in Heilongjiang province (northeastern China) increased from 2.2 million hectares in 1996 to 3 million in 1997, just below the record 3.1 million hectares in 1993. This area accounted for 38 percent of total soybean acreage in China. The increased production in Heilongjiang largely offset decreases in the North China Plain.

Peanut production declined for the second year in a row. The summer drought lowered peanut yields, and output decreased from 10.1 million tons in 1996 to 9.6 million in 1997. Most peanut producers in the North China Plain find better alternative crops in grains. Rapeseed production increased to 9.5 million tons in 1997, up 3.7 percent from 1996.

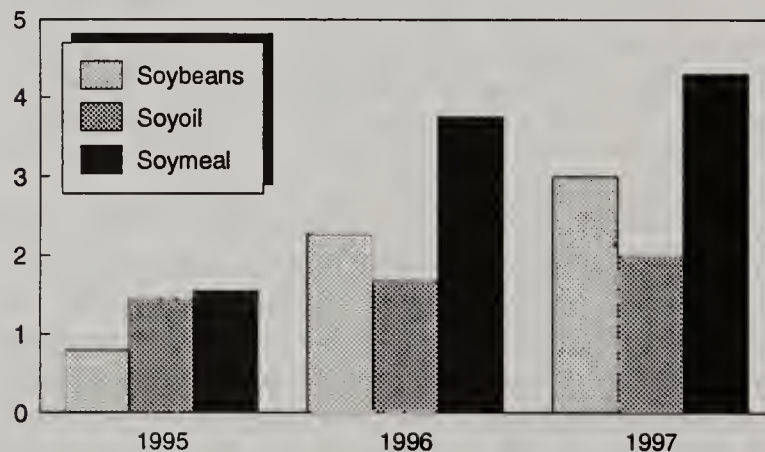
Soybean Meal and Oil Imports

China is now the world's second largest market for animal feed, and the government has placed no restrictions on importing soybean meal. Total soybean meal imports more than doubled in 1996/97 to 3.8 million tons, largely due to a favorable world market price (fig. 5). China's meal price climbed from RMB 1,700 in 1995 to RMB 2,900 per ton in late 1996 and became noncompetitive with world market

Figure 5

China's Rising Imports of Soybeans, Soymeal, and Soyoil

Million metric tons



1997 forecast.

Source: China Custom Statistics, various years.

Table 6—China's soybean, soymeal, and soyoil indicators, 1996/97-1998/99

	1996/97	1997/98	1998/99
	1,000 tons		
Soybeans			
Production	13,500	13,222	14,730
Imports	795	2,274	3,300
Exports	222	195	180
Soybean meal			
Production	6,051	6,952	8,600
Imports	1,550	3,750	4,300
Exports	100	24	7
Soybean oil			
Production	1,150	1,390	1,772
Imports	1,445	1,674	2,000
Exports	66	80	20

Source: SSB, *Agricultural Statistics Yearbook*, 1997; China Custom Statistics; and unofficial USDA forecasts.

prices at RMB 2,500 for most of the 1996/97 marketing period. Although China's soymeal production increased from 6 million tons in 1995 to an estimated 8.6 million in 1997, strong demand far exceeded the increased production. Soymeal imports rose from 1.5 million tons in 1995 to an estimated 4.3 million tons in 1997, an increase of 187 percent. China's State Administration of Grain Reserve estimated that soymeal consumption will increase again, but at a lower rate, to 12.2 million tons in 1997/98 (1).

China's trade authorities set annual import quotas for vegetable oils, including soybean oil. In 1996/97, imports accounted for nearly 50 percent of total domestic soybean oil consumption. Because of quota limitations, smuggling and unofficial trade became inevitable. China's Customs Administration reported that in one case, a trading company smuggled 20,000 tons of soybean oil from Brazil valued at RMB 140 million at Qingdao in April 1997. Private oil processors use unofficial channels to evade duties and value-added taxes by bringing in foreign oils for processing and fail to re-export them. Imports of edible vegetable oils could be higher if China lifted its quota restrictions.

Reference

1. Ren, Ping, *An Outlook of the Soybean Meal Market*, State Administration Grain Reserve, National Grain and Oil Information Center, Newsletter, April, 1998.

China's Livestock Economy: Introduction

China is the world's largest producer of animal protein foods and produces nearly five times more pork than the United States [see box, "China's Place in World Animal Protein Production"]. Although consumption per person is lower than in wealthier countries, it is growing along with China's economy (see appendix A). Increased demand for meats, fish, poultry meat, eggs, and milk in the future is likely to outstrip China's ability to produce these products using its own feed crops. China has the potential to become a large market for imported animal protein foods or feed-stuffs, particularly from the United States. The following articles represent a comprehensive examination of China's livestock economy using new data and information.

Over the past decade, research in ERS/USDA has identified several analytical issues and anomalies associated with

China's Place in World Animal Protein Production

China is a major world producer of animal proteins. This production is based on millennia-old livestock output traditions, a very large agricultural base with an estimated 130 to 140 million hectares of arable land, the world's largest grain production of nearly 500 million tons, and a vast land mass roughly the size of the continental United States with millions of acres of forest and rangeland.

China is the world's largest producer of pork, mutton, fish, and eggs. It ranks second and third in poultry meat and beef output respectively, but it ranks 18th in world milk production.

Table 7--China's and the U.S.'s rankings in world animal protein production

Item	China		United States	
	Ranking	1997 output	Ranking	1997 output
	No.	1,000 tons	No.	1,000 tons
Pork	1	42,500	2	8,609
Beef	3	5,400	1	11,714
Mutton	1	2,600	13	118
Poultry meat	2	11,500	1	14,945
Eggs (Mil. pieces)	1	336,000	2	77,520
Fish	1	27,300	5	5,900
Milk	18	7,650	2	71,150

Source: USDA, Production, Supply, and Distribution, data base, April 1998.
Data for 1997. Fish data come from FAO, press release, Number 97/35.

The Composition of China's Animal Protein Consumption

Pork accounts for half of all the animal proteins consumed by China's residents. Poultry meat and eggs contribute 26.5 percent of consumers' animal protein intake. Protein from fish accounts for 15.8 percent of consumption. Beef, mutton, and milk account for the remaining portion.

Table 8--Composition of China's animal protein consumption, 1995

Product	Protein by weight	Share of total
	Kilograms	Percent
Pork	1.96	49.92
Beef	0.13	3.31
Mutton	0.09	2.29
Poultry	0.46	11.72
Fish	0.62	15.79
Eggs	0.66	16.81
Milk	0.006	0.15
Total	3.926	100.00

Source: SSB, *Statistical Yearbook*, 1996. Weights of animal products were converted to protein weights using conversion factors listed in Bemice K. Watt and Annabel L. Merrill, USDA, Agricultural Handbook No. 8, *Composition of Foods*, 1975.

China's animal protein economy. Because of the size of China's population, small changes in per capita consumption of animal proteins lead to very large projected changes in China's demand for feedstuffs. Similarly, because of the size of livestock production, small changes in feed/meat conversion ratios can lead to large changes in feedstuff use projections. Several anomalies or contradictions in the data surrounding the animal protein economy of China suggest that the basic data may be misstated, leading to rather significant changes in the consumption/person and feed/meat ratios, with significant implications for global livestock and feed balances. The anomalies include:

- *Large gaps between reported available feed supplies and livestock output.* The quantity of grain for feed use from the grain balance sheets is not enough to support the reported livestock production (see *China Agriculture and Trade Report*, RS—88-4, June 1988). This suggests either that the feed/meat conversion rates are extremely efficient, or that grain output is underreported, or that livestock production is overreported.

- *An apparent contradiction between the growth in grain supplies and growth in livestock product output.* Livestock output growth reportedly continued at about 5 percent per annum regardless of the situation with grain supplies, even when production fell, stagnated, or grew slowly (see *China Agriculture and Trade Report*, WRS-96-2, June 1996).
- *A growing gap between meat availability per person (total meat production/total population) and the State Statistical Bureau (SSB) household sample surveys of meat consumption per person in urban and rural households.* ERS is preparing a special report on this topic which will be published toward the end of 1998.

The following articles seek to provide a better understanding of China's animal protein economy. They examine the main components—pork, beef, mutton and goat meat, poultry meat, fish, eggs, and milk—reviewing their places in the diet and farm structure of China [see box, “Composition of China's Animal Protein Consumption”]. The articles and the boxes that apply to the whole animal protein economy focus on the policy changes that have altered China's livestock and feed prices and marketing structures. Considerable attention is given to the data that are central to the anomalies noted above. The implications of this exercise are considerable for the current and future global balances of meat and other animal proteins, and for feeds to produce them.

China's Pork Economy: Production, Marketing, Foreign Trade, And Consumption

Pork production is the core of China's livestock industry. Policy changes and income increases have facilitated the rapid growth of the hog sector. As a result, feeding efficiency, marketing, and distribution of pork output improved. China is not an important player in international pork markets. Per capita pork consumption rose rapidly in the 1980s but slowed in the 1990s. Future growth in consumption likely will slow because of slower income growth and rising feed prices. [Francis Tuan, Xiaohui Zhang, and Eric Wailes]

Introduction

Pork production before 1949 fluctuated because of the Sino-Japanese and civil wars. After 1949, the founding year of the People's Republic of China, hog raising activities resumed, and by 1979 pork output surpassed 10 million tons for the first time. Since the mid-1980s the structure of hog production has been changing from traditional production techniques to more specialized and commercialized production units (see appendix D). Pork output increased rapidly from 1980 to 1996. The increases were supported by government policy changes and income increases. Rural economic reforms, which increased procurement prices, revitalized rural livestock markets, eliminated farmers' pig procurement quotas, encouraged development of the feed industry, established hog breeding programs, liberalized livestock product prices, and stimulated efficiency gains in pork production. Rising rural and urban incomes enabled residents to consume more pork.

Urban consumption of pork did not increase as rapidly as rural consumption in the last two decades. Per capita pork

consumption in urban areas is still significantly higher than that in rural areas. High feed grain prices are likely to slow output growth and pork's share of total meat consumption (pork, beef, mutton, poultry, and rabbit meat), which fell from 86 percent in 1980 to 68 percent in 1996, likely will continue to fall. Efforts will be made to improve hog feeding efficiency, but government policies likely will promote production of more efficient converters (poultry and fish) of grain and protein meals to meat.

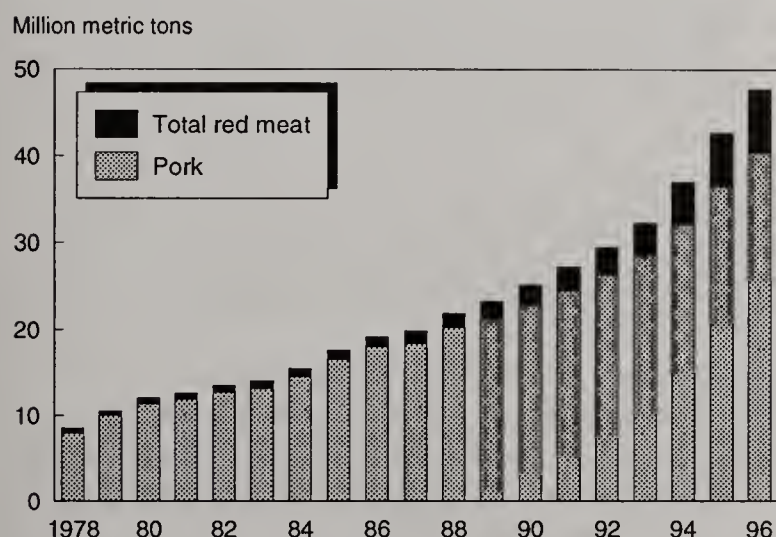
Pork production reached a record 40.4 million tons in 1996. Domestic demand rose significantly because of population increases and rising per capita incomes. In 1996, per capita pork availability reached an estimated 33 kilograms, compared with only 4 kilograms in 1949. Pork trade, largely exports of live hogs to Hong Kong, expanded in the 1970s and 1980s but began to decrease in the early 1990s because of competition from better quality live hogs or pork imported from other countries (table 9).

Steady Increase in Hog Production

China's hog development from 1979 to the present is characterized by rapid growth, which resulted from the implementation of rural reforms. The government adopted a series of policies to encourage farmers and specialized households to raise hogs. The policies included increasing procurement prices, deregulating livestock markets, enhancing the feed industry, providing better breeds and feeder pigs, and setting up a network of technical and veterinary services. As a result, yearend hog inventories rose from 320 million head in 1979 to 457 million in 1996. The slaughter rate, which is calculated by dividing the number of hogs slaughtered in a given year by the beginning inventory number for that year, is now close to 120 percent. The rate is much closer to the averages of about 150 to 160 percent common among western countries. China's 1996 pork output of over 40 million tons was the largest in the world.

In recent years, China's producers have managed to shorten the time needed for pork production, which is reflected by

Figure 6
Pork's Share in China's Total Red Meat Production



Source: China State Statistical Bureau.

Table 9--China's pork supply and use, 1980-98

Years	Hog slaughter	Pork output	Imports	Exports	Domestic consumption
	1,000 head		--- 1,000 tons ---		
1980	198,610	11,341	0	160	11,181
1981	194,950	11,884	0	166	11,718
1982	200,630	12,718	0	230	12,488
1983	206,610	13,161	0	248	12,913
1984	220,470	14,447	0	273	14,174
1985	239,034	16,547	0	263	16,284
1986	257,215	17,960	0	193	17,767
1987	261,810	18,349	0	200	18,149
1988	275,761	20,176	0	170	20,006
1989	290,231	21,228	0	203	21,025
1990	309,910	22,808	0	235	22,573
1991	328,971	24,523	0	268	24,255
1992	351,697	26,353	0	117	26,236
1993	378,240	28,544	0	150	28,394
1994	421,032	32,048	0	181	31,867
1995	475,591	36,484	3	230	36,257
1996	526,510	40,375	2	192	40,185
1997	560,000	42,500	3	150	42,353
1998	580,000	44,000	3	90	43,913

Source: USDA, P S and D, April 1998.

the tremendous increase in slaughter rates (table 10). They also were able to raise the average carcass weight of hogs from 49 kilograms per head in 1978 to nearly 77 kilograms in 1997. This measure is now much closer to weights observed in more developed countries. The improvement indicates that hog producers in China could obtain a larger marginal revenue from adding additional weight units by maintaining similar marginal costs as incurred previously.

Government Policies Encouraged Pork Production

Government policies played a critical role in the development of China's pork production over the last four decades. General policies associated with the development of hogs and other animals are described in appendix B. Specifically, the government:

- *expanded private and fodder plots.* In 1981, the government announced that private plots and fodder plots could be expanded from a minimum of 7 percent to a maximum of 15 percent of total cultivated land in collective farms. This change permitted households to grow more feed grains for livestock (6).
- *eliminated pig procurement quotas and low procurement prices.* This policy provided hog producers incentives to expand production, particularly in the early years of the reform period.
- *promoted the establishment of specialized household production units.* Since the mid-1980s, these policies encouraged livestock production by farm households and helped develop livestock operations run by collectives and state breeding farms. Collective farms were able to

contract with specialized households to produce larger hogs and state breeding farms were able to supply bigger and better young animals to specialized households. Specialized households currently contribute about 15 percent of pork output.

- *expanded the feed industry.* In the early 1980s, China's feed industry produced only a few million tons of compound feed. The government is not likely to achieve its feed output plan target of 100 million tons for 2000, since the current level of output is only about half of the target (see appendix C: China's Feed Industry). However, the development of the feed industry was encouraged by different levels of governments (central, provincial, county, and township). Feed output increased significantly in suburban areas and supported rapid growth of commercialized pork and poultry production around Beijing, Tianjin, and Shanghai.
- *initiated a reward system for hog producers.* A bonus system encouraged farm households to raise more hogs from the early 1960s through the early 1980s. Different provinces set different criteria for rewarding hog producers, though most often producers received bonuses of grain or chemical fertilizers, either free or at discount prices. The bonus system was virtually eliminated when the government procurement quota for hogs was abolished in 1985.
- *initiated a "food basket" program in 1989.* Under this policy, municipal governments encouraged farmers around big cities to provide more and better quality meat, including pork, and more milk and eggs for urban residents (see appendix D: Glossary of Terms).

Table 10--Pork output, yearend hog inventory, slaughter, slaughter ratio, and carcass weight

Year	Pork output	Yearend inventory	Number slaughtered	Slaughter ratio	Carcass weight
	1,000 tons	1,000 head	1,000 head	Percent	Kg
1980	11,341	305,431			
1981	11,844	293,702	198,607	62.1	57.1
1982	12,718	300,783	194,947	63.8	60.7
1983	13,161	298,536	200,627	68.3	63.4
1984	14,447	306,792	206,614	68.7	63.7
1985	16,547	331,400	220,471	73.8	65.5
1986	17,960	337,191	238,752	77.8	69.3
1987	18,349	327,733	257,215	77.6	79.8
1988	20,176	342,218	261,770	77.6	70.1
1989	21,228	352,810	275,700	84.1	73.2
1990	22,811	362,408	290,233	84.8	73.1
1991	24,523	369,646	309,910	101.5	73.6
1992	26,353	384,211	328,971	90.8	74.5
1993	28,544	393,001	351,697	95.1	74.9
1994	32,048	414,615	378,238	98.4	75.5
1995	36,484	441,692	421,032	107.1	76.1
1996	40,377	457,357	480,510	115.9	75.9
1997			526,635	119.2	76.7
1996 (U.S.)	7,766	59,920	92,394	164.6	85.5

Sources: 1. China Statistical Yearbooks, various issues.

2. Hogs and Pigs, USDA/NASS, Dec 1997.

3. Livestock Slaughter, USDA/NASS, Dec 1997.

Specialized Households and Modern Firms Becoming Important Pork Producers

China's hog feeding practices are different from those of western nations. To date, most hogs in China are still raised by rural households. After the dismantling of the communes in 1984, hogs were produced primarily by farm households, with a small percentage of pork output coming from collective and state farms. There are currently three types of hog production systems in China: 1) the traditional or small-scale backyard household production, 2) the specialized household production, and 3) the large-scale enterprise production.

The traditional or small-scale backyard hog producer typically raises one to several hogs. These producers accounted for almost 95 percent of total pork production in the mid-1980s, but their share dropped to 81 percent in 1996. These producers can be found in all areas of China.

The specialized household pork producers typically raise 10, 20, or even 100 pigs. They often sign contracts with commercial or large-scale hog enterprises to fatten hogs. Their numbers increased rapidly in the last 15 years (see table 11).

The share of large-scale hog production enterprises is also increasing, but at a slower pace. In general, large-scale production enterprises and specialized household production are mostly located around big cities, such as Shanghai, Beijing, and Tianjin. Specialized household producers also

Table 11--Share of pork production by production system

Year	Backyard	Specialized household	Enterprises
		Percent	
1985	94.6	2.9	2.5
1993	88.3	8.2	3.5
1996	80.7	14.6	4.7

Source: (9).

can be found in feed grain producing provinces or local areas that have grain brewery operations because of the availability of byproducts that can be used as energy feed.

A study of China's livestock sector was completed in 1997 by the Research Center for Rural Economy (RCRE), China's Ministry of Agriculture. The study, which was supported by the University of Arkansas, Iowa State University, and the Economic Research Service of the U.S. Department of Agriculture, includes a survey on feed use. The survey found that the feed conversion ratio (FCR, see appendix D: Glossary of Terms) for pork across production systems reflects significant improvement in the specialized household production systems compared with the backyard system. Feed use per kilogram of hog live weight gain is highest with the specialized households, then large-scale hog enterprises, and lowest with producers using traditional production techniques.

The concentrate feed conversion ratios (CFCR, see appendix D: Glossary of Terms) show a similar pattern across production systems, with traditional producers feeding 7 percent more than specialized hog operations. The specialized households use slightly less concentrates per kilogram of gain for pork compared with the large-scale hog enterprises. This is because specialized households reported using grain alcohol byproducts in addition to the concentrates. The feed grain conversion ratios (FGCR, see appendix D: Glossary of Terms) are surprisingly similar across all production systems. The implication is that concerns about the changes in the production structure are not particularly important with respect to feed grain use per unit of pork production. The result also suggests that the higher concentrate feed conversion efficiency (lower CFCR ratios) for specialized and large-scale enterprises is due to the oilmeal components, i.e. reflecting a higher protein feed concentrate.

Open Markets Becoming More Important, But Government Still Involved in Marketing

Hog marketing, including procurement, slaughtering and processing, distribution and provincial transfer, quarantine and inspection, and government marketing policies, have played an important role in the development of China's hog economy.

Marketing and pricing policies implemented by the government have been crucial to the development of the livestock sector. The government:

- *increased its purchase price for hogs.* The significant increase in procurement prices for hogs and livestock products in 1979 dramatically stimulated sales. The average procurement price of live hogs in 1979 was more than 26 percent above the previous year.
- *initiated reforms in livestock markets.* Revival of livestock trading markets contributed to the upsurge of farmers' incentives to feed hogs and other animals. The change provided chances for farm households to earn cash income. Yearend hog inventories posted great increases after the new policy was put into effect.
- *eliminated the fixed hog purchase price (the price at which producers had to sell their hogs to the state).* Beginning in early 1985, the government eliminated the low fixed pork prices and reformed the state hog procure-

ment system. Low hog prices prior to the reform encouraged farmers to sell grain to the government rather than feed it to hogs, especially in the northeastern provinces. Since the elimination of the fixed pork procurement prices, hog-to-grain price ratios became much more favorable to hog production.

Government Procurement System Changed

Before 1985, government procurement of live hogs was fulfilled through contracts by county food procurement and marketing stations and, in some rural areas, also by county supply and marketing cooperatives. But since March 1985, the central government eliminated the contract procurement system and replaced it with a system in which buyers and sellers negotiate an exchange price. China's farmers, in general, can sell their live animals, including hogs and livestock products, either through the government procurement system or in local rural markets after they secure a slaughtering permit.

Between 1965 and 1977, the government system procured 60-66 percent of all slaughter hogs each year. Between 1979 and 1984, the share rose to 69-72 percent. However, in the early 1990s government procurement dropped to 60 percent. In recent years, an increasing number of hogs have been slaughtered outside of the government system. Also, there has been an increasing amount of pork sold by private retailers in the rural markets. These markets developed very rapidly in recent years. China's State Statistical Bureau ceased publishing total number of hogs procured by the government in 1993, an indication that market forces are taking over the marketing and sales of slaughtered hogs.

Slaughtering and Processing Improving

In 1996, China slaughtered 526.6 million head of hogs, approximately five times that of the United States (3, 1997). Along with the significant increase in the number of hogs slaughtered in recent years, China has begun to build more modern slaughterhouses, particularly around big cities and in areas where hog raising has been concentrated, such as Jilin province. There is growing evidence of vertical and horizontal coordination in the slaughtering and processing industries. Many newly established slaughterhouses and their affiliated food processing companies developed processed food operations. One of the most popular and growing products made from pork is a cooked and ready-to-eat sausage. Other popular processed food made from pork includes canned lunch meat, dehydrated pork, cooked pork, and pork jerky.

Inspections and Disease Control Stressed

Hogs purchased by the government purchase system used to be slaughtered by either state slaughtering houses for hogs procured by the state-owned food stuff companies or by

Table 12--Feed use and pork output ratio by production system

	Feed conversion ratio	Concentrate pork ratio	Feed grain-pork ratio
Backyard	4.66	3.47	2.08
Specialized	3.69	3.24	2.06
Large-scale	--	3.30-3.80	2.00-2.28

Source: (9).

local small slaughtering booths for rural retail sales. Some hogs were also slaughtered by farm households for on-farm consumption. Vigorous inspections for slaughtered hogs were not performed in local slaughtering booths, although a permit was usually required by the local government.

Sanitary and disease inspections have been required and implemented in the state slaughterhouses. Animal and poultry disease control provisions were promulgated in 1984. But the government did not set up an agency to carry out unified inspections until 1994. In general, equipment used in inspection work was old and obsolete. Many inspectors were not professionally trained (5, 1996).

The government was forced to pay greater attention to animal disease control and meat inspection in 1994, when meat prices rose significantly and some contaminated or uninspected meat from diseased animals was sold on the market. Consumers were angry and upset with the lack of government regulations. The Ministry of Agriculture and local governments decided to implement measures to eliminate the sales of contaminated and unsanitary meat. By the end of 1994, 80 percent of the prefectures and counties (or cities) had established veterinary and sanitary inspection stations or agencies. Since 1995, the government has required that all marketed hogs be slaughtered and inspected at a slaughterhouse certified by the government (5, 1996).

Different Retail Distribution Systems Developed

Pork is an important part of the everyday diet of consumers in China. Supply and distribution of pork from slaughterhouses to retail markets is therefore critical to all consumers. Since most of China's hogs have been raised in rural areas, the government often gives priorities to procure live hogs from rural areas and then distribute pork to meet the demand of urban residents. In the 1950s, the central government began to require the commerce department and its state-owned food companies to be responsible for supplying most of the pork required by employees of state enterprises living in big and medium size cities. The distribution system was also expected to prepare pork products for export markets.

Four different systems have been used to supply pork to consumers over the last four decades:

- *Pork supplied through markets.* Individual consumers, collectives, and government units purchased pork freely in open markets. In some years floor and ceiling prices were fixed by government authorities. The policy was implemented by the government in 1949 and 1957, between 1965 and 1968, and between 1980 and 1985. Since 1985, all prices, including procurement and retail sales, have been basically liberalized, and consumers

have been able to purchase pork at prices determined by the markets.

- *Pork supplied through planned purchase and rationing.* In 1955, Shanghai was the first among China's three biggest cities to issue meat coupons for residents to purchase pork because of very tight supplies. This method was adopted all over the country from 1961 to 1963, until pork supplies improved in 1964. Beginning in 1969, meat coupons were widely used again for about 10 years. As rural reforms were instituted at the end of 1978 and in 1979, procurement of live animals and pork increased significantly. Meat coupons were no longer needed and therefore abolished.
- *Pork supplied for special requirements.* This program was established in 1957 and in 1959 by the State Council to ensure pork supplies for certain government employees, special professional staff, and workers of special occupations, including high level government leaders and senior researchers.
- *Pork supplied based on negotiated prices.* In 1961 and 1962, the central government began a program to supply pork and processed pork products in big cities according to prices based on hogs procured with negotiated prices (30-50 percent above the fixed quota price or close to market prices). The program was terminated by the Ministry of Commerce in 1964 as pork output increased. The same program was reinstated in 1979 to revive the incentives of livestock producers to raise more livestock products and is still an ongoing program. Hogs are raised by using feed or feed grains purchased at negotiated prices, mainly on the state-run hog farms, and are sold at negotiated prices, particularly through the government procurement system.

Storage and Transportation Emphasized

China's government does not publish official statistics on either cold storage capacity for livestock products or transportation facilities. The inability of procurement stations to handle the sudden surge of hog deliveries following the procurement price increases of 1979 was obviously due to limited holding pens and storage and the lack of transportation facilities. Rapid economic development, however, has begun to change that situation, with more highways being built and large slaughterhouses and storage facilities completed.

The transportation modes for transferring live hogs or pork from producing provinces to major cities have been improving, and transfers have become more frequent. For example, hogs raised in Jilin province are now slaughtered and processed into various types of cuts. This processed pork is then chilled and transported to supermarkets in Shanghai. Sichuan, the largest pork producing province, transfers mainly frozen pork to Russia and Eastern European countries.

In rural areas, pork is still sold the same day hogs are slaughtered. There are few cold storage facilities and refrigeration

erated cars used. According to a recent study, by the end of 1995 the refrigeration capacity of the entire country totaled over 5 million tons, of which over 4.5 million belonged to state-owned refrigerated storehouses (8).

Prices Liberalized

Hog producers faced two kinds of prices before 1985: the government fixed quota purchase (procurement) price and the retail sale price. The government price was the most important to producers because the government procured the majority of hogs. Purchase or government procurement prices were frequently adjusted in China before all prices were liberalized in 1985. The central government abolished the fixed procurement prices for hog production in early 1985 and also stopped controlling retail prices of pork sold through the government channels. Procurement prices have been replaced by prices listed in contracts negotiated between the government procurement stations and hog producers. Farmers without contracts can sell hogs without having to go through the government procurement system to fulfill any quota. The government now procures only a small percentage of total hog production. The price of hogs is now basically determined by market demand and supply. Quality-based price differentials are also more often observed in the market because consumers, now with higher income, prefer better quality and lean pork meat.

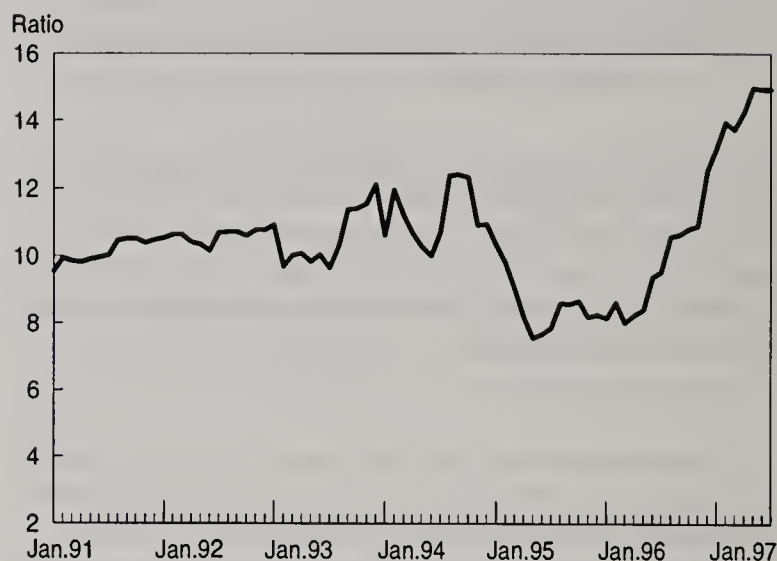
Corn has become the main feed grain for hogs. In large-scale hog farms around big cities and most specialized household hog farms, corn makes up 50-70 percent of the feed ration. Many household backyard hog feeding operations, which contribute about 80 percent of China's total pork output, also have begun to feed mixed or even compound feed to hogs. Ratios of pork price and corn or feed price have become an important indicator for hog production. For instance, in August 1997, the price ratio between pork and feed was on an upward trend and therefore the expectations of higher returns increased hog production. Fig. 7 illustrates the changes in price ratios between pork and corn in recent years.

Pork Consumption Grew Rapidly

Pork is a major source of animal protein for consumers in China. Pork provided as much as 70 percent of per capita meat consumption until recent years. Because of pork's importance as a major non-staple food, the central government, under the centrally planned economic regime, not only controlled hog production through procurement prices, but also controlled the marketing of pork through rationing in urban areas. Pork retail prices in urban areas were set by the government and were much lower than rural market prices. Only urban residents had access to the state-owned retail stores, and their consumption was limited by the rationed amount due to short supplies. From 1953 to 1977, per capita pork consumption in urban and rural areas increased only 28 and 11 percent, respectively. This growth

Figure 7

China's Pork/Corn Price Ratios



Source: Ministry of Agriculture, unpublished price series; USDA/ERS/MTED data base.

was inconsistent with the increase in per capita national income (130 percent) in the same time period.

Increase in Per Capita Pork Consumption

Pork consumption began to grow rapidly when economic reforms were implemented in the late 1970s. The major reasons for consumption growth varied with the process of the reform. In the early years of the reform period, the driving force for growth was the increases in pork supply. Pork output surged when farmers regained their power to make economic decisions and were allowed to sell pork to the market after fulfilling their hog procurement quota. With a high market price and government negotiated price, which was about 30 percent higher than the fixed quota procurement price, farmers had more incentives to produce pork for the market and hence pork supplies rose. Because supply shortages had constrained pork consumption, once consumers were allowed to enter the market freely, consumption increased significantly. From 1978 to 1982, per capita pork consumption increased by 28 and 63 percent in urban and rural areas, respectively.

During the second period, from 1982 to 1987, economic reforms made significant progress, and household income, especially that of urban households, grew rapidly. Thus, the driving force in the growth of pork consumption, in addition to the increase in supply, was the rapid growth of income. Urban and rural per capita pork consumption rose by 20 and 24 percent, respectively, in those 5 years.

Producers' procurement quotas for hogs were eliminated in 1985 (see appendix B for details on policy changes), and consumers began to face a single market price for pork. In addition, in 1992 and 1993, the government eliminated price subsidies on grain and vegetable oils consumed by urban

residents. Therefore, in recent years, price effects appeared to become increasingly important and growth of demand for pork decreased because of high pork prices. The increase in grain prices, particularly of corn, led to increases in the cost of pork production. As hogs are relatively inefficient converters of feed to meat compared with chicken, prices of pork rose more than those of other meat. Price differentials between pork and other red meat disappeared in the last 2 or 3 years and, hence, consumers, particularly urban households, consumed more other red meat and poultry meat. The growth rate of per capita pork consumption, as disclosed by the State Statistical Bureau household survey data, showed a flat growth trend for the last few years.

China's official statistics on pork consumption have a significant downward bias in recent years because of the difficulty of collecting the quantity of pork consumed outside homes and of processed pork products. Based on rough estimates by livestock economists in China, out-of-home consumption, mostly in urban areas, could be as high as 20 percent of total meat consumption. Therefore, growth in pork consumption in recent years should be up slightly more than the survey statistics indicate. However, prices for all meats, including pork, started to fall in the second half of 1997 and early 1998 due to slower income growth. The current slow growth of pork consumption compared with the continuous growth of pork output reflects, in general, that the demand for meat, including pork, has been weaker than the supply in the last 2 years.

Table 13--Pork consumption in selected and recent years

Year	Pork output Mil. tons	Per capita consumption		
		Average	Urban	Rural
		----- Kilograms-----		
1949	na	4.2	7.6	3.8
1953	3,515	6.1	10.1	5.5
1957	3,230	5.1	9.0	4.4
1961	930	1.4	1.8	1.3
1966	5,195	7.0	12.9	5.8
1978	7,890	7.7	13.7	6.4
1980	11,340	11.2	19.0	9.4
1984	14,447	13.0	18.7	12.7
1985	16,547	14.0	19.7	12.6
1990	22,811	16.6	24.6	14.5
1991	24,523	17.4	25.1	15.4
1992	26,353	18.2	26.1	16.1
1993	28,544	24.0	na	na
1994	32,048	26.6	na	na
1995	36,484	29.9	na	na
1996	40,377	32.8	na	na

Note: Data for 1952-66 are for pork consumption rather than output numbers.
na = Not available.

Sources: 1. (1). Pork consumption statistics for 1978-92 are from (1).
Per capita consumption numbers for 1993-96 were estimated by pork output minus net trade and divided by population.

An alternative way to examine consumption patterns is to compare per capita pork consumption data from household income and expenditure surveys with consumption in other countries. Urban and rural per capita pork consumption numbers for China for 1995 were multiplied by urban and rural population numbers to obtain 12.5 kilograms. Note this is substantially lower than the 29.9 kilograms of per capita pork consumption (or availability) referenced in table 13. Although per capita pork consumption in China is relatively low compared with that of the United States and Taiwan, the level is close to consumption patterns in Japan and South Korea (see fig. 8).

Foreign Trade

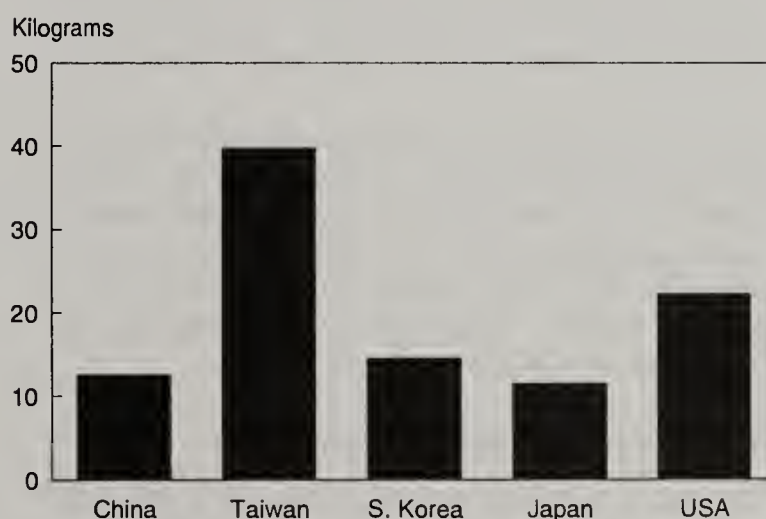
Since the establishment of the People's Republic of China, exports of hogs and pork products have been a principal earner of foreign exchange. Until 1970, the pork export share of total agricultural exports was around 10 percent. Beginning in 1980, the quantities of exports of pork and pork products were stable. But pork's share of total agricultural exports decreased as agricultural trade expanded after foreign trade liberalization and because the government promoted the expansion of other agricultural exports.

Live Hog Exports Shrinking

China has shipped live hogs, pork, and pork products to a small group of countries over the last four decades. Hong Kong and Macau have been the only export destinations for China's live hog exports. From 1970 to 1990, China shipped 2 to 3 million head of hogs each year to these two destinations with a peak of about 3 million during 1988-90. Total live hog exports to Hong Kong and Macau have since gradually declined, down to 2.5 million head for 1995 and 2.4 million for 1996 due to competition from better quality live hogs or pork imported from other countries (table 14).

Figure 8

China's Per Capita Pork Consumption Compared with Selected Countries, 1995



Source: USDA/ERS/MTED data base.

Table 14--Live hog, pork, and hog product exports

Year	Live hogs	Pork	Canned pork	Pig bristles	Pig casings
	1,000 hd	--- 1,000 tons ---		--- Mil. \$ ---	
1952	0.77	28	--		
1965	1.72	143	35	na	na
1970	1.70	81	22	na	na
1980	2.47	64	48	na	na
1985	2.96	111	99	72.6	38.1
1990	3.00	120	91	71.1	66.1
1991	2.85	120	128	34.0	62.5
1992	2.90	50	53	40.0	97.4
1993	2.72	60	72	25.1	100.2
1994	2.70	100	69	50.0	102.5
1995	2.53	150	64	65.4	157.7
1996	2.40	130	42	56.6	191.4

-- = Negligible.

na = Not available.

Note: Statistics for 1980 and before are from MOFTEC.

Sources: China *Statistical Yearbooks*, various years.

Pork exports, mainly frozen, have been shipped to the former Soviet Union, Eastern Europe, and some Southeast Asian countries. China exported 100,000 to 150,000 tons of frozen pork annually to those countries in recent years. With its ample pork supplies, China is likely to maintain this level of exports for the next few years. However, it will be difficult for China to expand the export market significantly without improving the quality of its pork, eradicating foot and mouth disease, and exploring new markets. The small scale of household hog raising in China is not producing quality pork suitable for exports. Better quality hogs or pork produced by the large-scale hog farms or by some specialized farm households can barely meet the urban domestic demand.

Foot and mouth disease, the financial crisis in Southeast Asia, stricter quarantine standards, and increased adoption of non-tariff measures by importing nations are the major factors expected to hinder China's pork exports. If China plans to maintain its share of these export markets and stay ahead of the intense competition, it is critical for producers to adopt scientific breeding methods, improve feed quality and feeding efficiency, establish modern slaughtering and processing facilities, develop modern marketing strategies, and enhance disease prevention and quarantine services.

Other hog-related products that have been exported and contribute to the nation's foreign exchange earnings include canned pork, pig bristles, and casings. The total export value of these products reached \$360 million in 1995 and \$377 million in 1996. These exports are expected to increase gradually in the next few years because of their specialty demand and uses (4, 1996 and 1997).

Hog and Pork Imports Negligible

Hog, pork, and pork product imports have been minimal, mainly because of government restrictions and high tariff

rates. China imports only a few live hogs for breeding purposes. China's hog breeders are interested in U.S. breeds and management practices of commercial hog farms. Imports of pork and hog offal or re-exports of these products from Hong Kong to China have been reported but no official statistics are available (4).

Tariff rates and value added tax on live hogs and pork for 1997 have been similar to those of 1996 and are shown in table 15 (4, 1997).

Slow Growth in China's Hog Industry Expected

Over the next decade, pork production and consumption in China likely will increase slowly (see appendix E). While per capita pork consumption in urban areas is slowing down compared with that of rural residents, consumption patterns also suggest that urbanites eat more pork than rural residents. The growth in population and rural to urban population shifts likely will stimulate some demand for pork. On balance, both production and consumption of pork will rise more slowly because of reforms in China's social welfare system, reform of the housing system, the streamlining of government organizations, and the slowing of income increases due to slower economic growth.

Table 15--China's tariff rates for live hogs and pork

Item	General	MFN rates	Value added tax
		Percent	
Live hogs, breeding	0	0	13
Live hogs, other	50	12	13
Pork, fresh	70	45	13
Pork, chilled or frozen	70	45	17

Source: (4, 1996 and 1997).

China's gross domestic product increased at a double-digit annual average rate in the last decade. This growth rate is expected to slow from 10 percent in 1996 to 8.4 percent in 2000-2005 (7), but most economic forecasts continue to see positive growth rates despite the current problems in South and East Asian economies. The positive stream of income will encourage consumption of pork but at a slower pace than before. Income elasticities for pork for both urban and rural consumers likely will decrease in the coming decade.

Pork is currently the preferred meat in China. But if China is not able to increase grain and oilseed production to meet domestic feed requirements, the price for pork may rise because hogs convert feed into meat less efficiently than poultry and fish. A relative increase in the pork price vis-a-vis other meat prices may induce consumers to substitute other animal proteins for pork.

Foreign demand for China's pork products is not seen as a major factor affecting future developments. Currently China's net pork exports constitute less than 0.2 percent of domestic consumption.

Several USDA studies of China's agricultural economy during 2005-2025 forecast that production of feed grains and oilseed meals will increase through time but that demand will outpace supplies and the gap between supply and demand likely will widen. With increasing tightness in domestic feed grain and oilmeal supplies, one should expect producers to implement efficiency measures to save on scarce feed inputs. One of the strategies already in place and supported by government programs is to accelerate the growth of the poultry, aquatic product, and grass-fed bovine animal sectors because they are more efficient than hogs at converting feed into meat.

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China's Beef Economy: Production, Marketing, Consumption, And Foreign Trade

China's beef industry expanded rapidly in the last two decades. Under a favorable policy and marketing environment, traditional draft-beef cattle operations in North China have been successfully transformed into efficient beef cattle production. The technology of feed ammoniation treatment was an important contributing factor. [Xiao-peng Luo]

Government Livestock Policies Affected Beef Production

Traditionally, China's beef supply has come from both pasture regions and intensively cropped farming regions. Cattle in pasture regions were mainly raised for meat, but in farming regions, cattle were raised for both draft and meat purposes. Because of the differences in resource endowments and in production structure, the impacts of government-enforced low producer prices and collectivization had different effects on beef production in the two regions. For the pasture area, with lower producer prices and higher costs, there was a choice to increase output and revenue at the expense of publicly owned pasture resources. However, for the intensively cropped farming regions, this choice was not available (See appendix B).

One of the choices faced by China's policymakers was to allow cattle (even collectively owned animals) to be raised by households while farm land was collectivized. However, because draft cattle were classified as a 'means of production,' according to Marxist dogma, the Communist Party of China decided that cattle should not be owned or controlled by individuals.

Given government-fixed low beef prices and high production costs, most collectives in the farming regions abandoned raising cattle for beef and kept cattle only for draft

purposes. As a result, beef production in farming regions declined significantly after collectivization. The decrease was not offset by increased production in pasture regions. The decline of beef production in farming regions was tolerated by China's policymakers mainly because hog output was more important in these regions. Government and Party officials implemented policies that were more flexible and positive toward hog production.

The forced collectivization initiated many policies that had a negative impact on farmers. Farmers often slaughtered and consumed their draft animals rather than having them confiscated by the collective. To prevent peasants from eating collectively owned draft animals, the government imposed strict restrictions on slaughtering. Each collectively owned draft animal, like each collective farm member, had to be registered in the formal accounting records to be issued grain rations. The grain ration quota for a draft animal in some cases was higher than that for a man. When famines occurred, collective farm members often stole feed grains designated for collectively owned draft animals for use as table grain. Collective farm members also arranged accidents for draft animals to bolster their meager diets. The consequence of this economic environment was that cattle inventories were high, official reports of feed grain use were high, but the quantity of beef marketed out of the system was small.

Table 16--Government retail prices compared with farm market prices, 1952-92

	1952	1956	1961	1963	1966	1971	1973	1976	1979	1983	1989	1990	1992
Beef price, gov't retail (RMB/kg)	0.83	1.00	1.04	1.10	1.16	1.16	1.16	1.19	1.40	2.05	6.41	6.38	6.43
Pork price, gov't. retail (RMB/kg)	0.92	1.00	1.71	1.71	1.60	1.60	1.56	1.62	1.74	2.18	5.40	5.30	5.77
Average percentage by which the prices in farm markets are higher than the gov't. rationing price 1/	na	na	220	129	41	54	75	90	57	48	7.80	-22	5.70
											17.30	14	5.50

na = Not available.

1/ The number shown in the upper level was the difference between government prices and farm market prices in small towns, the lower level shows the difference between government prices and farm market prices in large cities.

Source: State Statistical Bureau, China.

The fact that beef prices in 'free markets' were significantly higher than the government rationing price suggests a shortage of beef supplies (see table 16).

In the mid-1970s, a kilogram of beef in the open farm market was worth more than 5 percent of the monthly pay for an average worker. In terms of relative prices, the beef price was about 10 percent lower than the pork price in the early 1950s. In the 1980s, the situation changed in favor of the beef price, and even the government had to increase its fixed beef ration price faster than pork. Unlike pork, beef was not always available in 'free markets' because of the government restriction on private slaughtering. Therefore, before the reform, beef rarely appeared on the dinner tables of ordinary people except for limited amounts of rationed beef for the Muslim population.

Beef Output Rose Steadily in the Reform Period, 1980-1998

When agricultural reform started in the early 1980s, the prospect for increasing per capita beef consumption looked very dim. Population was increasing in both farming and grazing regions, and the degradation of pasture in grazing regions, such as Inner Mongolia, was so severe that those regions could not sustain significant growth of cattle production without long and costly investment.

From 1978 to 1997, China's beef output rose more than 17 percent a year (table 17). Even acknowledging the fact that China's beef output may have been overreported by 20 to 30 percent in the mid-1990s, the annual growth rate would still be more than 10 percent.

Some of China's experts have reported that there are defects in the official reporting system that led to overstatement of beef production. (1 and 7). Both underreporting and overreporting of beef output occurred during the last two decades.

Because of the restrictions on slaughtering draft animals before the reform, the official estimate of beef output was based on the report from the state meat distribution system, which was under the complete control of the government. Obviously, some local slaughtering took place outside of the government system and was not reported. Considering the large size of China's rural population, the unreported beef output could be significant compared with the relatively small amount of the marketed beef output.

In the early stages of the reform, beef output tended to be underreported because non-government slaughtering was not covered by the official estimate. In other words, beef output in the early 1980s was likely underestimated when the government started to loosen the restrictions on private slaughtering, while the official estimate of beef output was still based on the previous reporting system. In the late 1980s, as private slaughtering grew too large to be ignored and too difficult to report, the official estimate of beef output changed its base from cattle slaughtered to cattle sold. This change opened the door for overreporting.

A primary source of upward error was multiple counting of sold cattle. Before the reform, the level of specialization was low and most beef cattle were sold only once, so the bias was tolerable. As cattle trading expanded between breeders and feeders, rather than between feeders and

Table 17--China's beef supply and use, 1980-98

Years	Slaughter 1,000 head	Production	Imports	Exports	Domestic consumption
			---1,000 tons---		
1980	3,322	269	0	0	269
1981	3,016	249	0	8	241
1982	3,100	266	0	12	254
1983	3,937	315	0	16	299
1984	3,869	373	0	15	358
1985	4,578	467	0	15	452
1986	5,550	589	0	26	563
1987	7,403	793	0	34	759
1988	8,552	958	0	54	904
1989	9,428	1,072	0	57	1,015
1990	10,883	1,256	0	155	1,101
1991	13,039	1,535	0	222	1,313
1992	15,192	1,803	1	75	1,729
1993	19,000	2,337	2	155	2,184
1994	24,479	3,270	3	74	3,199
1995	30,497	4,154	3	95	4,062
1996	37,015	4,946	3	79	4,870
1997	40,000	5,400	3	60	5,343
1998	43,000	5,800	7	50	5,757

Source: USDA, P S and D, April 1998.

slaughterers, the errors mounted as the same animal was counted multiple times.

Another source of upward error was the local governments, which often benefited from overreporting agricultural production. The growth of cattle production was an important criterion in competing for financial support from the central government. The combined consequence of underreporting in the early stage of the reform and overreporting in recent years is that the average annual growth rate was inflated.

Cattle Production Increased In Cropped Regions

Reports from China reveal that in the last two decades there was a breakthrough in beef production in the intensively cropped regions in North China. Traditional draft/beef cattle raising was transformed into more efficient beef cattle production. This breakthrough has been the main driving force behind the rapid growth of China's beef output.

The immediate impact of the reform policy on cattle production was a sharp increase of the slaughter rate in farming regions at the expense of total inventory. However, in a few years, both the slaughter rate and inventories grew faster than in the grazing regions (see table 18).

Historically, even in China's farming regions, grazing was important to reduce the cost of raising beef. Because grazing resources became very limited, expansion of beef cattle production in the farming regions depended on finding new sources of low cost feed. In the late 1980s, under support from the Food and Agriculture Organization of the United Nations (FAO), the technology of feed ammoniation treatment was successfully field tested in North China (See appendix D). Realizing the enormous economic potential of the technology, China's government launched a major program in the 1990s to promote ammoniated feed in farming regions. Some recent studies by China's economists show that introducing this new feed treatment technology to a large number of rural households greatly accelerated the

conversion of draft to beef cattle raising. The success of the transformation brought a number of new characteristics into China's beef production.

A New 'Beef Belt' Emerged In the North China Plain

The promotion of the new technology was most successful in some areas of Shandong, Hebei, Henan, and Anhui, four provinces in North China. Some officials called this area China's "Beef Belt." According to the State Statistical Bureau the share of cattle inventories in these four provinces increased from 16 percent of the national total in 1985 to more than 30 percent in 1996. The rural areas in the new "Beef Belt" share some economic factors favoring the new technology.

First, rural labor is abundant. The rural labor force in the four provinces ranks in size in China as second (Henan), third (Shandong), fifth (Anhui) and sixth (Hebei).

Second, the "Beef Belt" is located within China's principal production areas of wheat, corn, soybeans, peanuts, and cotton. After producing a record grain crop of 400 million tons in 1984, China produced 500 million tons of grain in 1996. The four provinces in the 'Beef Belt' contributed more than half of the growth. There are ample local feed supplies in this area to support promotion of the new technology. Beside crop residues such as wheat, straw, and corn stalks, cottonseed, soybean meal, and peanut meal provide an ideal source of low-cost protein.

Third, traditional skills, climate conditions, market accessibility, and proximity to large high income urban markets were complementary to the new ammoniated feed technology. The new "Beef Belt" has replaced China's grazing region to become the main supplier of commercial beef (see table 19).

Small Operations Dominate Beef Cattle Production

According to Lu Mai, a noted researcher in China, small-size household operations dominate China's beef cattle economy. A typical cattle raising household on the North China Plain keeps two to four cattle (1). China's agricultural reform in the early 1980s evenly distributed collectively owned farmland to rural households. This peculiar land tenure arrangement clearly had a limiting impact on the average size of operations.

Many households specializing in cattle production were from so-called 'specialized cattle raising villages' where more technical support was better served by government extension and village leadership. The positive effects of village clustering greatly offset the negative effects that resulted from the limited size of household cattle raising

Table 18--Changes in cattle slaughter rate and inventory in farming and grazing regions

	Slaughter rate			Inventory		
	1978	1980	1985	1978	1980	1985
	Percent			1,000 head		
Farming region						
Shandong	2.0	4.0	11.9	2,276	2,178	2,580
Hebei	3.0	4.2	11.3	1,347	1,207	1,551
Henan	3.5	2.9	5.8	3,391	3,396	6,099
Anhui	2.5	3.6	6.4	2,084	2,409	3,983
Grazing region						
Inner Mongolia	10.1	14.3	10.6	1,192	3,537	3,965
Xinjiang	8.0	10.2	14.8	2,352	2,506	2,933

Source: The Department of Livestock, the Ministry of Agriculture, China.

Table 19—China's beef production: Intensive vs. pasture regions

	1985	1990	1991	1992	1993	1994	1995	1996	1985	1990	1996
	--- 1,000 tons, carcass weight ---								--- Percent ---		
China	467	1,256	1,535	1,803	2,336	3,270	4,154	4,949	100.00	100.00	100.00
Northeast	28	122	167	216	310	503	709	910	6.00	9.71	10.88
Heilongjiang	10	52	67	88	111	180	237	310	2.14	4.14	4.36
Jilin	11	36	49	61	85	116	175	257	2.36	2.87	3.19
Liaoning	7	34	51	67	114	207	297	343	1.50	2.71	3.32
Beef Belt	122	512	636	734	1,052	1,603	2,076	2,436	26.12	40.76	41.43
Hebei	19	56	70	99	193	362	546	608	4.07	4.46	4.56
Shandong	48	176	210	272	393	620	648	802	10.28	14.01	13.68
Henan	30	182	248	257	326	440	644	730	6.42	14.49	16.16
Anhui	25	98	108	106	140	181	238	296	5.35	7.80	7.04
Pasture area	125	209	230	243	254	264	288	334	26.77	16.64	14.98
Inner Mongolia	47	86	96	99	106	105	94	119	10.06	6.85	6.25
Qinghai	36	52	53	57	55	59	63	63	7.71	4.14	3.45
Xinjiang	42	71	81	87	93	100	131	152	8.99	5.65	5.28

Source: China, Ministry of Agriculture, Agricultural Yearbook, selected issues.

operations. According to China's Ministry of Agriculture, more than 7 million households applied the feed ammoniation technology during 1989-96 (2).

High Feed Efficiency

Recent estimates of China's grain-beef conversion ratio were between 2 and 4.8 (Garnaut and Ma, 1992). A survey in Fuyang prefecture, Anhui province, revealed that rural households on the North China Plain feed about 300-350 kilograms of grain per head of cattle, suggesting that much of the weight gain comes from grass and crop residues. If the average net weight of meat output per head is about 150-200 kilograms, the grain-beef conversion ratio is between 1.5 and 2.4. According to the same survey, the ammoniation technology did not necessarily reduce grain use per head, but it did significantly increase the efficiency of non-grain feed, which increased profitability for beef producers. A household that was using ammoniated feed could save 50 percent of crop residues (See appendix C).

Rural-Based Slaughtering and Marketing

Before modernization, China developed a highly sophisticated rural marketing system. Rural brokers and butchers (usually family businesses) efficiently linked cattle breeders, feeders and consumers through the market network. The market-oriented system was replaced during the era of agricultural collectivization (1955-1985). In its place government authorities established a highly centralized food distribution system that included a state-run slaughtering and meat processing industry and a state-owned meat retail (rationing) system (see appendix B).

In the early 1980s traditional livestock marketing and slaughtering practices were revitalized across the country as

household cattle breeding was restored. In 1985, compulsory meat procurement and subsidized meat rationing to urban residents were abolished. The government food distribution system had to face market competition. The low cost of marketing and slaughtering run by peasants put tremendous pressure on the government food distribution system. Many mechanized slaughtering facilities run by the state were forced to close down. According to a field study, the mechanized slaughtering factories processed less than 10 percent of the animals slaughtered in the five provinces in the farming region (Hebei, Henan, Shandong, Anhui, and Sichuan) (1).

However, the political and economic environment still does not allow large private firms to take over the urban-based state-run meat companies. Rural entrepreneurs introduced a new form of organization for cattle slaughtering and beef marketing to take advantage of economies of scale. Hundreds of so-called "Villages Specialized in Cattle Slaughtering" emerged in the rural markets where beef cattle were actively traded. In each "specialized village" there were up to a hundred so-called "Households Specializing in Cattle Slaughtering." Each household could slaughter several hundred and in some cases even more than 1,000 head of cattle annually. In the same village, there were other households that specialized in cutting, packaging, storing, shipping, and marketing. So the capacity of the whole specialized village can be greater than a state-run meat company. In the five provinces where cattle production grew most rapidly, specialized villages actually slaughtered more cattle than the mechanized slaughtering factories run by the government.

Some specialized villages built large cold storage facilities. Before the reforms only state-run slaughterhouses were

What Ammoniation Does

Ammoniated feed is produced by placing crop residues with high-cellulose content in a sealed container (silo) and adding either anhydrous gas or liquid ammonia.

Ammoniation:

- increases the crude protein equivalent by 3 to 10 percent
- increases the digestible energy (TDN) by 3 to 23 percent
- increases animal intake by 20 to 27 percent
- prevents molding of crop residues and high-moisture forages.

Ammoniated feeds are especially useful for ruminant animals such as cattle and sheep but provide few benefits to horses, pigs, and poultry. Producers need to be aware of toxicity problems when they use ammoniated feeds (Feed & Nutrition, edited by Ensminger, Oldfield, and Heinemann 1990).

allowed to use cold storage facilities. Nevertheless, most plants in specialized villages used traditional manual slaughtering techniques rather than modern techniques (see table 20).

While the specialized villages ship their products to remote markets, there are thousands of traditional butchers scattered in local markets. According to China's government reports, these individual butchers accounted for more than 50 percent of total beef output. So the cattle slaughtering business in China is highly decentralized and dominated by traditional technology. In terms of control of food quality and safety, this has been a major drawback from the progress made before the economic reform. It has been extremely difficult for the government to enforce food safety laws to protect consumers.

Consumption and Price Trends

China's official estimates of beef consumption have a significant downward bias because of the difficulty of

accounting for consumption outside of homes and the consumption of processed meat products. Per capita income increased more rapidly during the 1980s than in any recent decade. Based on direct observation in China, the income elasticity of expenditures on beef in restaurants and processed meat products was significantly higher than that for home-cooked meat during this period. The design of the State Statistical Bureau's household survey did not capture this change in consumption patterns. Because pork is the principal meat cooked at home, beef, mutton, and poultry are meats that provide variety in the diet. As a result, the proportion of beef consumed in restaurants or as processed products is believed to be much larger than the corresponding proportion of total pork consumption. If this is true, the downward bias of China's official estimates on beef consumption is expected to be much greater than the bias for pork consumption.

In 1996, China's official estimate of red meat consumption was about 22 kilograms per urban resident, of which 2 kilograms were beef (SSB, household survey data). Evidence of the understatement of beef consumption can be seen from the negative income elasticity calculated from the household survey data. According to the data, the per capita beef consumption in the high income group was lower than that of the lower income group. This finding contradicts direct observation of consumption patterns in China today.

One way to estimate the consumption missed in China's income and expenditure survey is to treat the unreported beef consumption as a residual. Some of China's experts believe that China's beef output in 1996 was 20-30 percent overreported (1). This means that between 0.5 and 1 million tons of beef consumption were missed in China's official household survey data (see fig. 9). In other words, about 20 percent of beef consumption was likely not being reported, most of which was consumed outside the home or in the form of processed beef.

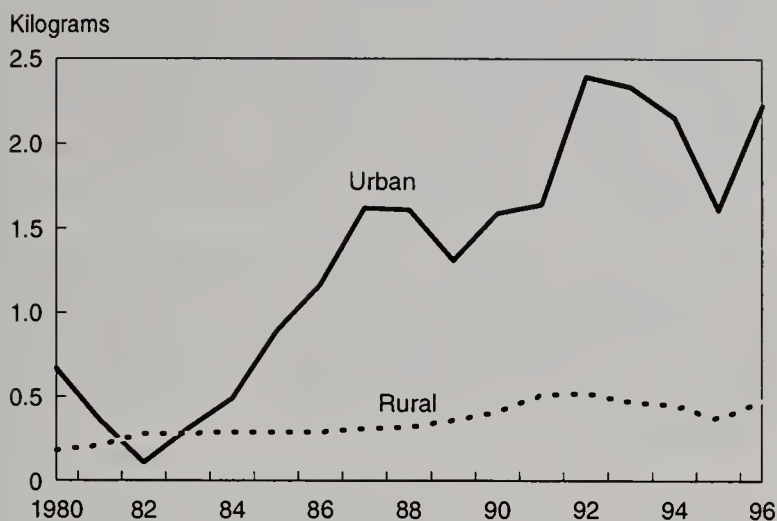
The following assumptions were used to estimate the trend in beef consumption in the last two decades: (1) in the late 1970s and early 1980s, China's total beef consumption was significantly higher than the total marketed beef output,

Table 20--Cattle slaughtering capacity: Mechanized state factories vs. specialized villages

Province	Capacity of state-run mechanized		Villages specialized in cattle slaughtering and capacity		
	factories		of a typical specialized village		
	5,000 to 10,000 head per year	Over 10,000 head per year	Specialized villages	Name of the leading village	Capacity of the leading village
	Number		Number		Head
Hebei	3	5	100	Beiwu Village	120,000
Henan	10	3	28	Mazhuang Township	250,000
Shandong		5	80	Liumiao Village	60,000
Anhui	3	4	21	Changguang Township	150,000
Sichuan	9	8	30	Miao Township	30,000

Source: Lu, "Cattle Production in China's Farming Region," a research report of CAPICA, Sept. 1996.

Figure 9
**China's Per Capita Urban and Rural
 Beef Consumption**



Source: China State Statistical Bureau.

which was officially taken as the total beef output; (2) the official report of beef output in 1996 was exaggerated by 20-30 percent. Based on these assumptions, per capita beef consumption in the last two decades increased from 0.4 kg to about 2.4-3.0 kg, an annual rate of 9-12 percent. Although this estimate of growth in beef consumption is much lower than the official report on growth of beef production (17 percent), it is still remarkably high.

The real price of beef fell after reforms were initiated in the late 1970s. This can be seen from the narrowing gap between the government retail price and the farm market price (see table 16). Like other food prices, the real price of beef increased significantly during 1987-1988 and 1994-1995, the two periods of inflation. After peaking in the sec-

ond period of inflation, beef prices declined in 1996 and 1997. The current beef price is heading toward a new low.

The relative prices of beef and pork experienced dramatic changes. Up to the mid-1980s, the beef price was 30 percent higher than the pork price. From 1988 to 1995, beef and pork prices in North China were about same. Starting in 1996, the relative prices of beef and pork changed as the pork price went up and the beef price went down. By the end of 1996, beef prices were 40 percent lower than pork prices in Jinan, the capital city of Shandong, the top beef-producing province (see fig. 10).

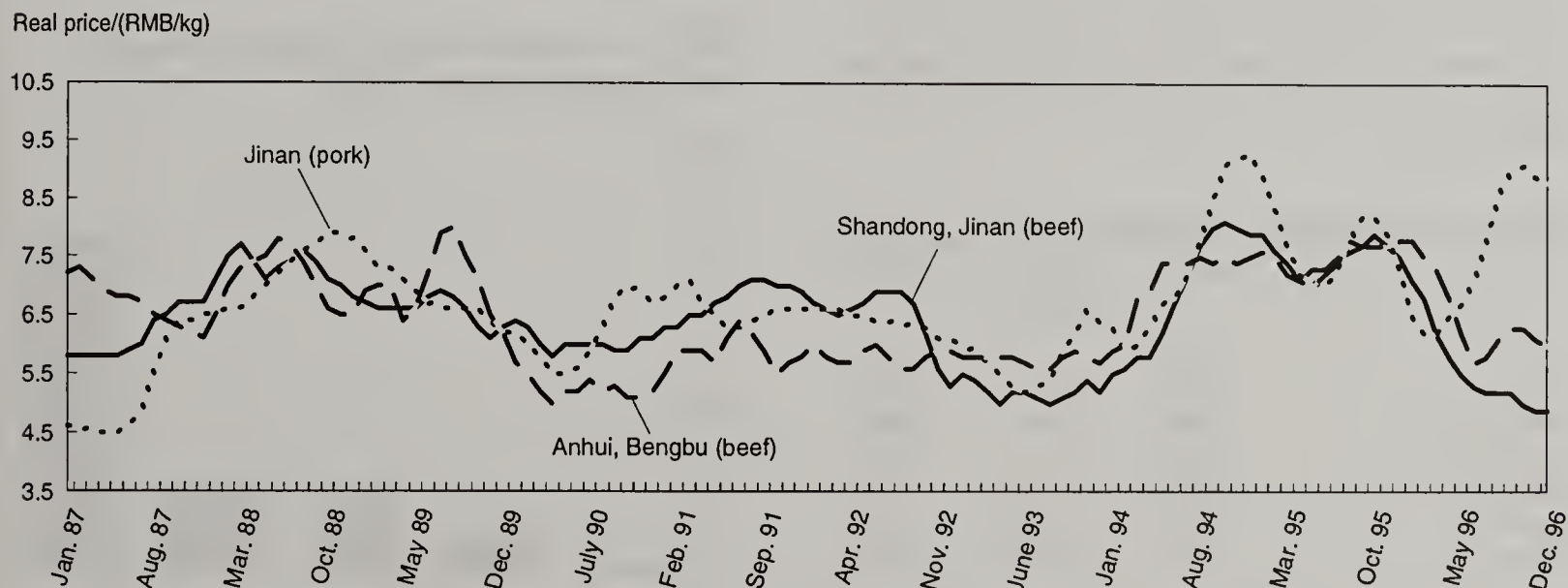
These beef price trends were consistent with the beef output trend. The high relative price generated strong incentives for beef production until 1996, when weaker market prices put a brake on the growth of beef production for the first time since the 1980s.

Beef prices in South China have been about 10 percent higher than in North China, indicating that local supply could not meet local demand. However, the inter-regional price gap has declined, reflecting progress in market development. Before marketing reforms, retail prices in large cities were much higher than in small towns close to producing areas. After reforms, the gap in prices narrowed.

Foreign Beef Trade Small

In the 1950s, China exported more than 10 percent of its total market supply of beef. The main destinations were the former Soviet Union (FSU) and Eastern Europe (SSB). Since the mid-1960s, exports of live beef cattle and fresh beef to Hong Kong have dominated China's beef trade. Beef exports to Hong Kong were no more than 30,000 tons.

Figure 10
Beef and Pork Price Trends in North China, 3-Month Moving Average



Source: Ministry of Agriculture, Research Center for Rural Economy.

However, in the last few years the rapid increase of beef production and demand for high quality beef began to change China's cattle and beef trade pattern.

Since 1990 exports of frozen and canned beef to the countries of the former Soviet Union increased significantly. Exports to FSU countries could be several times greater than those to Hong Kong, but compared with total domestic supply, China's beef exports will remain negligible in the foreseeable future.

On the other hand, imports of breeding cattle (genetic materials) and beef products from Western countries increased dramatically. Beef imports rose from 425 tons in 1990 to 25,000 in 1996. This number does not include unregistered imports.

China's authorities intend to meet the demand for high quality beef by increasing domestic supplies rather than by importing high quality beef. While expanding feedlot production in some farming areas, such as Shandong, the government imposed a protective tariff rate (50 percent for most favored nation [MFN]) on imported beef cattle and beef products but excluded tariffs on breeding cattle. The possibility for China to import significant amounts of beef from the world market in the future is small because China's policymakers prefer to use its low-cost labor to produce more beef domestically. For example, in the last few years there has been a significant increase in imports of breeding beef cattle and genetic materials. China intends to import up to 10,000 head of beef cattle from Canada.

However, the prospect of importing more feed grain will depend on demand conditions for high quality beef. In the last few years, American fast food chains, such as McDonald's, have become very popular in China's large cities. This part of beef consumption currently takes a very small portion of China's total beef consumption. However, if it continues to grow at current rates in the next decade, it may have a significant impact on China's beef production. Because small rural households have difficulty providing high quality beef, China may have to build more large feedlots, which could increase pressure to import feed grain and oilseed meals.

Table 21--China's beef exports by destination

	1995	1996	1997
	Metric tons		
Russia	6,558	19,982	21,291
Hong Kong	9,292	6,381	6,868
Korea, DPR	926	1,142	1,122
Macau	231	104	85
Japan	415	115	0
Others	1,557	671	2,128
Total	20,130	28,683	31,494

Source: China Customs.

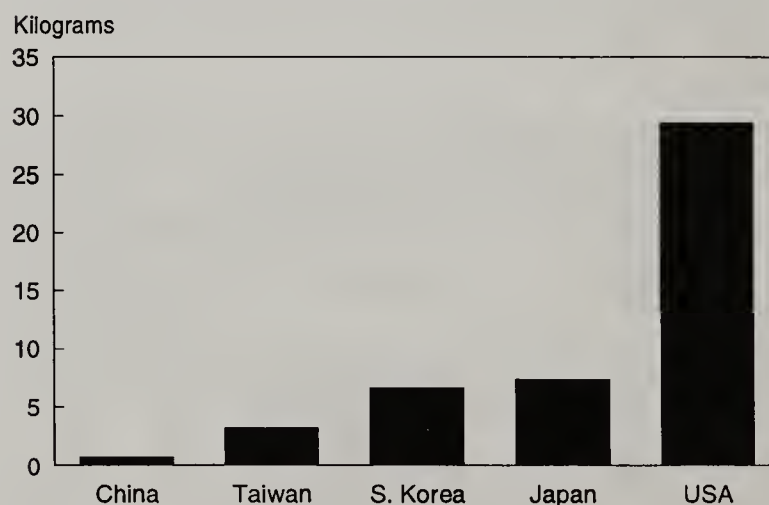
Good Prospects for Grass-Fed Beef

Compared with its Asian neighbors and the United States, China's per capita beef consumption levels are still quite low (see appendix A and fig. 11). China's agricultural experts and policymakers are very optimistic about the outlook for beef output in the next decade. Although China's domestic demand for red meat is expected to grow at slower rates because of the lower economic growth rate, it is believed that China's beef output will continue to increase faster than output of other animal products. It will certainly outpace the rise in pork production in the next decade. Because the increase in beef production will come primarily from grass-fed beef, it likely will not put greater pressure to import more feed grain from the world market (See appendix E).

This outlook is based on the following reasoning. First, there is potential to expand the use of ammoniated feed technology. By 1996, even in areas where most of the beef was being produced in the North China Plain, only 50 percent of the households were using the new technology. Second, while the demand for meat and other livestock products continues to grow, China's limited farmland resources will continue to be a severe constraint to increasing domestic feed grain supplies. On the other hand, China's labor cost, especially for family farm labor, will remain low for many years to come. The ammoniated feed technology can use labor-intensive methods, and this fact provides China with an opportunity. With abundant rural labor supplies, farmers can substitute labor for scarce farmland to significantly increase the nutritional value of crop residues and other non-grain forage resources. Beef production will benefit more from this technology. Third, the current average size of cattle feeding operations is too small to benefit from the economies of scale associated with modern feeding operations. However, this will change as more rural residents leave the countryside in the next decade.

Figure 11

China's Per Capita Beef Consumption Compared with Selected Countries, 1995



Source: USDA/ERS/MTED data base.

The potential for other technical progress, such as importing new cattle genetics, is also enormous. The government will increase its investment in these technologies and in the extension system. The growth of beef supply in South China will pick up as more artificial pastures can be developed. Some officials of China's Ministry of Agriculture have proposed a target of 10 million tons of beef output for the year 2000, equivalent to current U.S. production (2). This target is based on the overreported current level of beef production.

Taking all positive factors into consideration, it seems that the more realistic and sustainable annual growth rate for China's beef output could be about 5-percent on average in the next decade. Assuming that China's beef output in 1998 is about 4 million tons, the 5-percent annual growth rate would mean China is projected to produce around 7 million tons of beef by the year 2010. Assuming China's population will reach 1.4 billion in 2010, per capita consumption is estimated at around 5 kilograms.

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China's Mutton and Goat Meat Economy: Production, Marketing, Consumption, and Foreign Trade

Both mutton and goat meat production have increased significantly since 1980. The total number of goats exceeded the sheep inventory for the first time in 1994. Sheep/goat meat's share of red meat consumption rose from 3.7 percent in 1980 to 5 percent in 1996. Higher income and diversification of daily meals contributed to the rapid growth in consumption.

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Mutton and Goat Meat Production Increase

Mutton has been a traditional delicacy in Chinese cuisine. Consumption peaks in the winter season when family members get together for special "hot-pot" meals. Mutton also shows up in various gourmet menus and is popular in major restaurants, especially in northern cities. Strong sheep/goat meat demand reflects the diversification of daily diets for affluent urban residents. Mutton also is considered the most important animal protein for Muslims. China's Muslim population, at 9.3 million, accounts for less than 1 percent of total population. (7) Religion has been an important but not a dominating factor in mutton consumption in China.

Traditionally, most goats and sheep were raised in open pastureland or semi-desert areas in the Northwest (Xinjiang, Inner Mongolia, and Ningxia), and Tibet, where the Muslim population is highly concentrated. However, there is an

increasing trend of raising goats in traditional crop production areas on the North China Plain because of feeding efficiencies gained from using crop residues such as corn stalks and small grain straw (see Luo's article for a similar argument for beef cattle). Mutton and goat meat, wool, goat milk, and goat skin output have all increased rapidly (table 22).

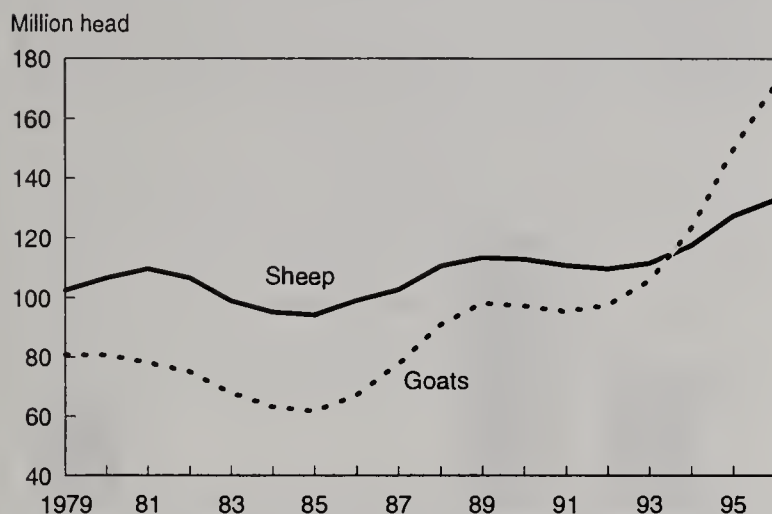
The State Statistical Bureau (SSB) reported that the combined sheep and goat inventory was 303 million head at the end of 1996 (6). Goats accounted for 56 percent of the total. Growth in meat production has been equally strong, with sheep/goat meat production nearly doubling from 1992 to 2.4 million metric tons (carcass weight basis, excluding head, hooves, and offal) in 1996. Future prospects for sheep/goat meat output are promising. China's Ministry of Agriculture indicated 3 million metric tons of output is an attainable target for 1998.

Table 22--China's supply and use of mutton, 1980-98

Years	Slaughter 1,000 head	Production	Imports	Exports	Domestic consumption
			---1,000 tons---		
1980	42,419	445	0	0	445
1981	44,814	476	0	0	476
1982	48,942	524	0	0	524
1983	48,444	545	0	0	545
1984	50,805	586	0	0	586
1985	48,526	593	0	0	593
1986	52,271	622	1	3	620
1987	60,529	719	0	4	715
1988	68,272	802	0	3	799
1989	81,229	962	0	1	961
1990	89,314	1,068	0	3	1,065
1991	98,162	1,180	0	4	1,176
1992	102,666	1,250	0	3	1,247
1993	112,000	1,373	0	10	1,363
1994	121,010	1,650	0	1	1,649
1995	165,373	2,015	2	3	2,014
1996	180,000	2,400	3	8	2,395
1997	200,000	2,600	3	8	2,595
1998	200,000	2,900	3	8	2,895

Source: USDA, supply use tables, June 1998.

Figure 12
China's Yearend Goat Inventories Rose Faster Than Sheep Numbers



Source: China State Statistical Bureau.

In addition to meat products, goats and sheep have other major byproducts such as wool, mohair, milk, and hides. Most goat milk is consumed as a fresh product and only small quantities are processed into cheese or butter (see Crook's article on Dairy). China ranks third in world wool production with 280,000 tons in 1996. Cashmere (*shanyan-rong*) output in 1996 was 9,585 tons and mohair (*shanyang-mao*) production totaled 35,284 tons.

Goat and sheep raising is heavily concentrated in the North China Plain (Shandong and Henan) and in the western semi-desert areas (Inner Mongolia and Xinjiang) (table 23).

China is moving away from wool-use sheep to meat-use goats (*caiyang*). China's wool textile industry has yet to achieve its full potential by international standards, partly because of the low quality of domestic wool (1). Given prevailing wool and meat prices, farmers shifted from wool to meat production.

China's goat and sheep production is usually a family operation with an average flock of less than 50 per household. There are a few large-scale commercial operations on state

farms. Usually farmers favor small ruminant animal production (in contrast with cattle) because of low start-up costs and relative low mortality rates. This is particularly true for young farmers and those with small holdings (low income groups). Also, because goat and sheep adapt more easily than cattle to new environments, farmers in remote areas with relatively low farming technology prefer to raise small ruminant animals.

After reforms were initiated in the early 1980s, specialized goat- and sheep-raising households were gradually established. The government provided no financial subsidies to individual households, but cadres delivered necessary technical expertise. In 1996, there were 1.14 million specialized goat and sheep households that produced 35.7 million head of goats and sheep and accounted for about 38 percent of total commercial sales.

Almost all sheep in China were pasture-fed before the 1980s. Sheep and goats are grazers, preferring natural grass, including weeds and brush. Without a clear description of feed mix, a national average feed/meat conversion ratio was reported at 5.73:1 in Inner Mongolia in the early 1980s. (10) A recent survey conducted by the Ministry of Agriculture, Research Center for Rural Economy, showed that the feed conversion ratio had improved to 4.72 for specialized mutton production households in 1997. (9)

Mutton Prices Peak During Chinese New Year

Government procurement programs (in the form of price supports) for both live sheep and goats ended in 1993. At present, sheep/goat meat is marketed with little government intervention. Similar to other meat products, sheep/goat meat prices peak during the winter season, especially during Chinese New Year festivities. The average annual sheep/goat meat price stayed above beef, pork, and chicken meat prices for the past 6 years except in 1996. Meat products are closely substitutable, and the competition is strong in China.

Open-air, traditional markets have been a part of urban city life for generations. Based on a recent report, 75 percent of

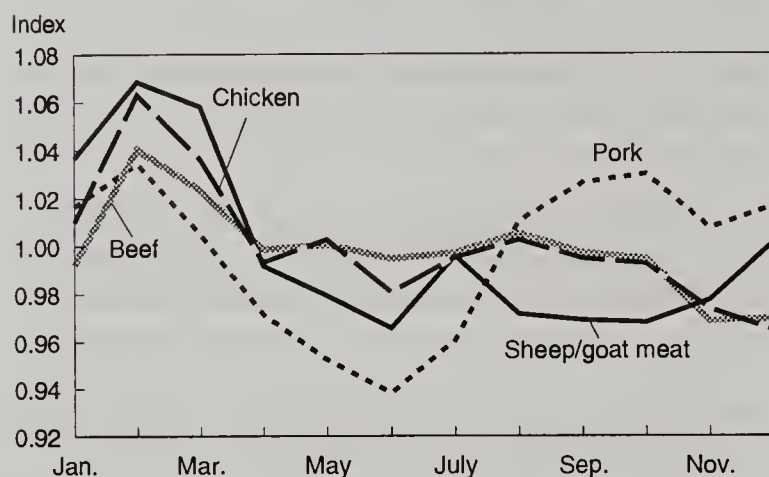
Table 23--Ranking of China's goat and sheep inventories and major byproducts, by provinces, 1996

Ranking	Goat inventory	Meat	Sheep inventory	Wool	Goat milk
1	Shandong	Shandong	Xinjiang	Inner Mongolia	Shandong
2	Henan	Henan	Inner Mongolia	Xinjiang	Shaanxi
3	Inner Mongolia	Xinjiang	Qinghai	Shandong	Hebei
4	Jiangsu	Inner Mongolia	Shandong	Hebei	Xinjiang
5	Sichuan	Jiangsu	Tibet	Heilongjiang	Henan
6	Hebei	Hebei	Gansu	Gansu	Tibet
7	Anhui	Sichuan	Hebei	Qinghai	Shanxi
8	Yunnan	Anhui	Shanxi	Jilin	Inner Mongolia
9	Tibet	Gansu	Heilongjiang	Liaoning	Heilongjiang
10	Shaanxi	Shanxi	Sichuan	Shanxi	Liaoning

Source: State Statistical Bureau.

Figure 13

Wholesale Sheep/Goat Meat Prices, Seasonal Price Movements



Note: Seasonal indexes constructed from 1991-97 monthly data.
Source: China, Ministry of Agriculture, unpublished price data.

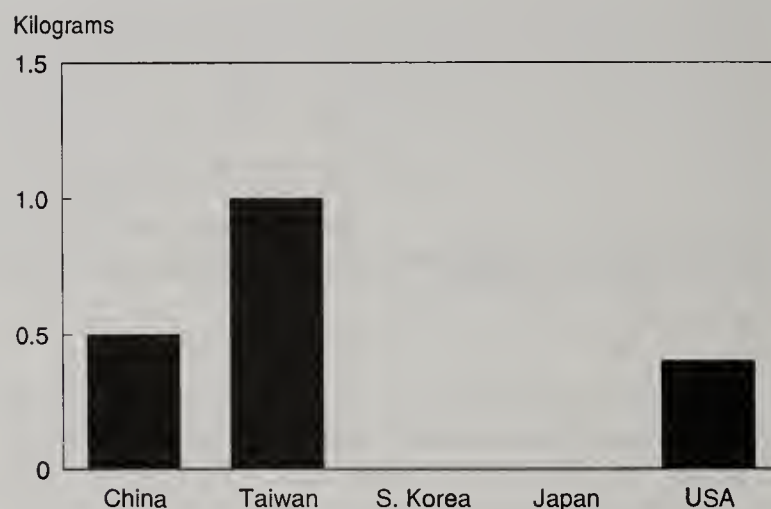
all beef and sheep/goat meat sales in Beijing went through urban open-air markets (4). Refrigerated storage spaces for meat products are increasing in major metropolitan area supermarkets. However, consumers still favor freshly cut meat and feel that chilled and vacuum-packed meat products only enhance food sanitary standards, not necessarily the product value.

Per Capita Consumption of Sheep/Goat Meat Remains Low

In 1996, sheep/goat meat accounted for 6.3 and 4.5 percent of total red meat consumption for urban and rural consumers, respectively (see table 24). SSB data show that the annual per capita consumption figures for sheep/goat meat were 1.29 kg and 0.58 kg for urban and rural consumers, respectively, in 1996. An average urban consumer ate twice as much meat as an average rural consumer. SSB data also show that higher income groups consume more meat than lower income groups. SSB per capita consumption figures exclude restaurants and away-from-home consumption, which would further raise sheep/goat meat consumption. China's officials calculated an alternative consumption indi-

Figure 14

China's Per Capita Mutton and Goat Meat Consumption Compared with Selected Countries, 1995



Source: USDA/ERS/MTED data base.

cator of per capita sheep/goat meat availability by dividing output by population. The estimated indicator was 2.2 kg in 1997, up 13 percent from the previous year and much higher than rural and urban household consumption figures.

The top five sheep/goat meat consuming provinces are concentrated in the north and northeast provinces including Shandong, Jiangsu, Henan, Hebei, and Liaoning. Per capita consumption, based on provincial averages, is still concentrated in northern urban cities (e.g., Tianjin, Beijing) and western provinces such as Xinjiang, Qinghai, and Ningxia with large Muslim populations. These two cities and three provinces have a combined average annual per capita sheep/goat meat consumption of 3.2 kg, five times higher than the national average of 0.58 kg in 1996.

Consumption of lambs less than 1 year old with an average weight of 35 kg is becoming increasingly popular in urban restaurants. Consumers are willing to pay higher prices for tender meat. Also, producers are willing to sell the lambs and kids at young ages because additional meat gain for yearlings is limited.

China's Foreign Sheep/Goat Meat Trade Is Small

China's mutton imports are limited to hotels, restaurants, and food processors. Total imports are negligible. In 1996, most of the imported 3,400 metric tons of sheep meat came from New Zealand. U.S. sheep meat and sheep remain banned from China because of the presence of scrapie in the United States.

The tariff structure applicable to mutton and sheep provides protection to domestic producers but makes special provisions so breeding animals can be more easily imported. The

Table 24--Per capita sheep and goat meat consumption, 1993-96

	1993	1994	1995	1996
Urban				
Sheep/goat meat (kg)	1.28	1.17	0.97	1.29
Total red meat (kg)	20.76	20.22	19.68	20.37
Share of sheep/goat (%)	6.2	5.8	4.9	6.3
Rural				
Sheep/goat meat (kg)	0.36	0.33	0.35	0.58
Total meat (kg)	11.68	11.00	11.29	12.90
Share of sheep/goat (%)	3.1	3.0	3.1	4.5

Source: State Statistical Bureau.

duty for importing live sheep from most favored nations (MFN) is 12 percent, while imports from other countries face a duty of 50 percent. All imports are subject to a value-added tax of at least 13 percent. The VAT rises to 17 percent for chilled and frozen mutton. Duties for importing fresh, chilled, or frozen sheep/goat meats are 45 percent and 70 percent from MFNs and non-MFNs, respectively. (8)

China exported about 47,000 head of live sheep to Saudi Arabia and Nepal in 1996. An insignificant amount of sheep/goat meat, about 1,000 tons in 1996, went to Hong Kong, Macau, and United Arab Emirate areas. China is both a major producer and a major net importer of wool. In 1997, China imported 206,427 tons of wool and exported 22,377 tons.

China is preparing to join the World Trade Organization. Unlike most crops, China's meat products, except poultry meat, have a price advantage over the world market. Based on a calculated average level of the base period for concessions and an assumed comparable average grade, the price of sheep/goat meat in China is 54 percent lower than on the world market. (2) China's analysts believe China has a comparative advantage in meat product prices compared to neighboring countries. They also see profit in exporting meat products. China supports a trade strategy of "having two ends abroad" with respect to meat production. This strategy allows the import of a portion of animal feed requirements, which is transformed internally into value-added meat products that are then exported to the world market. China continues to consolidate markets in Hong Kong and Macao, and it is looking into opportunities to increase sales to neighboring Japan, New Independent States (NIS) countries, Indonesia, and the Middle East.

Growth Expected To Stay Strong

Mutton prices have been attractive enough since the mid-1980s to encourage producers to expand their production. (5) China's leaders also place great hope on the development of ruminant animal production to increase meat output. They estimate that China has about 250 million hectares of pastureland in the northwest semi-desert area and in its hilly southwest area. Currently, some of these range and pasture areas could be improved for goat meat production. However, farmers need capital to make serious investment efforts. Also, range and pastureland ownership issues have bothered individual farmers.

China is also promoting the expansion of ruminant animal production in crop-growing areas. This feed-saving strategy was a part of the "food basket" program with a mission to

improve the people's daily diet. China's Ministry of Agriculture recently estimated that about 80 percent of sheep/goat meat production came from crop-growing areas instead of traditional livestock areas. (3) By feeding animals straw and corn stalks, and by using ammoniated feeds (a process of adding ammonia in digesters to improve the quality of feed—see box in beef section), MOA officials estimated a total saving equivalent to 44 million tons of feed grains for all animals. Officials are optimistic because some of the currently unused crop residues can be used for sheep and goat feed.

In addition to supporting efforts to enhance feeding efficiency, China also has invested in breeding, slaughtering, and processing in the entire meat products sector. The government is encouraging specialization in an effort to reach more profitable economies of scale.

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China's Poultry Economy: Production, Marketing, Consumption, And Foreign Trade

China is one of the world's largest poultry producers, but also a net importer of poultry products. The United States, the world's largest poultry meat exporter, is interested in prospects for its products in the China market. The Hong Kong/China market is currently the second largest destination for U.S. poultry and egg exporters. Even though China's broiler output is forecast to grow, there will continue to be a large market for poultry imports. [Frederick W. Crook (202-694-5217) and David J. Harvey (202-694-5177)]

Rapid Growth in Poultry Production

China's poultry meat production increased rapidly during the past two decades. Official estimates indicate that output more than doubled from 1.5 million tons in 1984 to 3.2 million in 1990. During the 1990s, China's poultry meat production accelerated at an annual rate of 22 percent, reaching 11.5 million tons in 1997. According to official data, egg output tripled within 11 years from 111 billion pieces in 1986 to 336 billion in 1997 (table 26).

Prior to 1980 China's leaders focused their attention on the output of red meat (pork, beef, and mutton). But in the early 1980s they began to concern themselves with the prospect of feed shortages. Rising incomes encouraged animal protein consumption, and rising livestock populations required more feed. If the expansion in red meat production continued, it would eventually threaten China's concept of grain self-sufficiency. Consequently in the early 1980s, policy makers began to favor expanding China's poultry industry because chickens, ducks, and geese are more efficient feed converters than hogs, cattle, and sheep (See appendix B for details).

Structure and Composition Of Poultry Production

China's statisticians define poultry to include chickens, ducks, geese, and other birds such as quail, pigeons, doves, emu, and ostriches. A wide variety of native chickens, ducks, and geese are raised in rural areas, in addition to foreign poultry breeds that were introduced in the 19th and 20th centuries. Most poultry is produced by households using traditional production techniques (See appendix D for details). Many traditional farm households keep a flock of poultry around the farmstead to forage in the fields for whatever they can eat, supplemented by some feed. Researchers estimate that this traditional method accounts for about half of total poultry output. For example, in 1997 individual household producers were the only suppliers of poultry meat and egg products in Guizhou province.

Farmers raise layers mainly to produce eggs for their own consumption or for sale on the local market. They similarly slaughter spent layers and other birds for their own consumption or sale on the local market. The period for growout using traditional techniques is longer than with

Table 25--China's poultry meat supply and use, 1986-98

Years	Production	Imports	Exports	Domestic consumption
Million tons				
1986	1,879	0	28	1,851
1987	2,040	0	58	1,982
1988	2,744	24	92	2,676
1989	2,840	49	94	2,795
1990	3,229	68	110	3,187
1991	3,952	130	123	3,959
1992	4,540	174	158	4,556
1993	5,736	240	176	5,800
1994	7,550	344	252	7,642
1995	9,347	625	390	9,582
1996	10,746	850	410	11,186
1997	11,500	900	435	11,965
1998	12,500	850	430	12,920

Source: USDA, Production, Supply and Distribution data, April 1998. Poultry data have been available from China sources since 1986.

Table 26-China's egg supply and use, 1986-98

Years	Production	Imports	Exports	Domestic consumption
Million eggs				
1986	111,000	0	3,219	107,781
1987	118,000	0	3,422	114,578
1988	139,100	4	1,145	137,959
1989	140,900	23	814	140,109
1990	158,920	53	786	158,187
1991	184,000	50	788	183,262
1992	203,980	88	965	203,103
1993	235,960	25	627	235,358
1994	281,010	7	647	280,370
1995	301,860	25	501	301,384
1996	312,640	3	715	311,928
1997	336,000	5	957	335,048
1998	360,000	5	1,110	358,895

Source: USDA, Production, Supply and Distribution data, April 1998. Poultry data have been available from China sources since 1986.

commercial operations. With increases in the numbers of feed mills and modern hatcheries and the availability of rural livestock extension assistance, a rising portion of households are adopting more modern production methods (see appendix C for details).

Statistical sources in China define specialized poultry producing households as those that devote most of their labor and receive most of their income from poultry operations. There is no single definition for these households, however. The number of specialized households increased rapidly after rural reforms were initiated in the early 1980s. Typically, a specialized household will raise five batches of broilers a year with 1,000 to 2,000 birds in a batch. In some areas, specialized households serve as contract growers for large integrated poultry operations.

Researchers estimate that specialized households produce about 40 percent of China's poultry output. For example, 489,000 specialized households in Henan province produced 34.5 percent of the province's total volume of poultry. These households obtain chicks from modern hatcheries and mixed or formula feeds from mills. Technical assistance is provided by the village or township animal husbandry extension station and by their contractors. These households employ both traditional and modern production technologies, with the main trend toward use of well recognized poultry production techniques. There is potential for production gains as these households gain more experience and more widely adopt modern production practices.

Currently, there are many large-scale poultry facilities in China, mostly located around large urban areas and near east coast ports. Some are wholly domestic facilities, but many are joint ventures with firms from the United States, Singapore, Thailand, Hong Kong, Taiwan, and Japan. These facilities typically are either near major urban population centers like Beijing, Tianjin, Harbin, and Wuhan, or near

low-cost transportation routes such as the lower Liaodong peninsula, and the ports of Qingdao, Shanghai, and Canton, where poultry products are sold both to local urban consumers and to the export market. Modern facilities produce about 10 percent of poultry output.

Markets Increasingly Important in Economy

Government authorities promote the growth of poultry production and the expansion of marketing services from farm-gate to consumer to boost output, reduce costs, improve employment opportunities in rural areas, and boost rural income (See appendix B for details).

Government Role in Egg and Poultry Meat Marketing

In 1985 the government ceased issuing procurement quotas and ended price fixing. Since then open markets have governed the egg and poultry meat sector. However, government-owned farms and slaughterhouses also continue to produce eggs and poultry meat.

The government's "food basket" program (cai lan zi), initiated in 1989, has encouraged municipal governments to support local egg and poultry producers. The government encourages the development of hatcheries, poultry vaccines, feed mills, slaughterhouses, shops to manufacture slaughterhouse equipment, cold storage facilities, and the construction of marketing space by granting loans and expediting applications for these facilities.

Thirty-seven large modern integrated poultry enterprises supply a large share of poultry meat for urban consumers. In 1996, central leaders in Beijing urged local municipalities to set support prices for broiler and egg producers higher than production costs to encourage farmers to keep producing when market prices fall below the support price. We do not

know what proportion of the municipalities actually have fixed support prices.

Before the mid-1980s, all larger poultry slaughtering facilities were owned by the Ministry of Internal Trade (MIT). Although MIT still controls most of the large poultry processing plants, other government entities, joint ventures, and private firms have entered the processing industry since 1985. Currently there are wide differences in slaughtering facilities between coastal and inland, urban and rural, and developed and underdeveloped areas.

Two government ministries are involved in poultry meat inspection. The Ministry of Health is responsible for meat food safety. Applicants must submit plant designs and obtain approval before construction begins and the ministry sends inspectors to the newly constructed plant. The Ministry of Agriculture (MOA) has the responsibility to supervise the inspection of poultry meat. The ministry also trains and supervises the veterinarians who inspect poultry meat. The inspectors are employees of the plant, not MOA employees. Veterinarians perform ante and post mortem inspections and also observe slaughter procedures.

Egg Marketing

In the early 1950s, eggs were marketed in the traditional way with producers selling to private purchasers, wholesalers, and retail vendors. During the Great Leap Forward period (1958-1961) open markets were closed and state-owned enterprises controlled the purchase and supply of eggs. The urban and rural free markets were reopened in the early 1980s and by 1985, the central government allowed eggs to be bought and sold freely at open market prices. In 1996 open markets numbered nearly 67,000 in rural areas (more than one per township), with another 18,000 markets in urban areas.

The only information on the egg marketing rates comes from the rural household sample survey teams of China's State Statistical Bureau. Their survey data report that the average farm household in 1991 produced 24.75 kilograms of eggs and sold about 12.51 kilograms, implying a marketing rate of 50 percent.

Poultry Meat Marketing

Before 1958 live poultry and poultry meat were not classified as important products and hence received scant attention from government authorities. During the economically stressful Great Leap Forward, however, these products were reclassified as important. State-owned commercial firms and supply and marketing cooperatives issued contracts to poultry producers to supply specified products. By 1985, however, live poultry and poultry products were freed from government marketing controls.

The rural household sample survey teams found that the average farm household in China had 12 poultry birds on

hand at the end of 1991. The teams also found that the average household sold six birds off the farm and slaughtered three birds for its own consumption. These data suggest that about 65 percent of the birds ready for consumption were marketed off the farm while the remaining 35 percent were consumed on-farm.

The USDA Broiler Team visited China in 1997 under the USDA and Ministry of Agriculture Science and Technology Exchange Program. They noted in their trip report that birds from farm families typically are sold in local food markets (1). Consumers pick out a live chicken and the vendor kills the bird, scalds it, picks off the feathers, eviscerates it and hands the white dressed chicken to the customer. The team witnessed these operations in both small towns and in large metropolitan areas. The team concluded that most spent hens from traditional and specialized households—and most likely also from modern facilities—still are marketed through local food markets. Generally these birds are slaughtered and consumed on the same day, reducing the requirements for cold storage.

On the other hand, broilers from specialized households and from large modern broiler operations are sold to state-owned or joint venture slaughter facilities. The fresh, chilled, or frozen meat is sold in local food markets equipped with freezer bins, in food stores, and in newly emerging supermarkets. Most of the frozen chicken parts the team saw throughout China came from domestic slaughterhouses. Frozen paws (feet) and wings from foreign countries were found mostly in traditional local open markets.

Prices

The State Planning Commission's Price Bureau publishes data on retail prices for 35 large metropolitan areas. Typically, it reports retail prices for fresh eggs and for dressed poultry. The Ministry of Agriculture's Information Center also has price information on rural market prices for eggs, though not for poultry meat. Note that both the urban and rural prices published in China are given in RMB per kilogram. We used the "General retail price index" to deflate those prices.

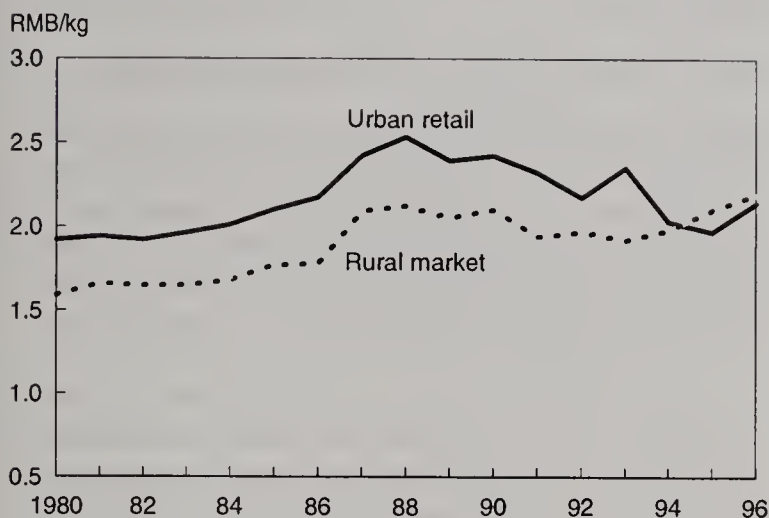
Egg prices from rural markets are believed to be fairly close to farmgate prices. In real terms these prices rose from 1980 to 1989 but have since leveled out (see fig. 15). Urban retail prices also increased in the same period, but beginning in 1990, they dropped, falling below rural prices in 1995. From 1980 to 1989, the ratio of the farmgate price to the retail egg price averaged around 83 percent, compared with 48 percent for the United States (*Agricultural Outlook*, April 1998). The price spread narrowed in 1993, and rural prices exceeded urban retail prices in 1995 and 1996.

Poultry Meat and Egg Consumption Rising

Egg and poultry consumption by both urban and rural consumers rose from the early 1980s through 1996. There is a

Figure 15

China's Real Urban Retail and Rural Market Prices For Fresh Eggs



1978=100.

Source: USDA/ERS/MTED data base. China Price Bulletin, various issues.

considerable gap between consumption in rural and urban areas. China's officials are now trying to reconcile per capita production numbers with per capita consumption data obtained from sample surveys (See appendix A for details).

Since the 1930s, egg consumption in China has changed dramatically. John L. Buck's 1930s surveys found that the average rural family consumed only 41 hens' eggs per year (0.46 kilograms per person). Eggs were sold off the farm to obtain cash and were consumed at home "...only as a luxury on special occasions." Rural fresh egg consumption rose from 1.3 kilos in 1981 to 3.4 kilos in 1996. Rural sample survey teams collected data in 1991 that can be used to examine rural egg consumption patterns. With regard to regional patterns, residents in East China consumed an average of 3.6 kilos per capita, compared with 2.7 kilos in Middle China, and 1.6 in Western China. Households with higher grain production levels also consumed more eggs. For example, a household that produced under 100 kilograms of grain tended to consume 2.6 kilos of eggs per capita while households that produced more than 1,000 kilos of grain consumed 4.3 kilos.

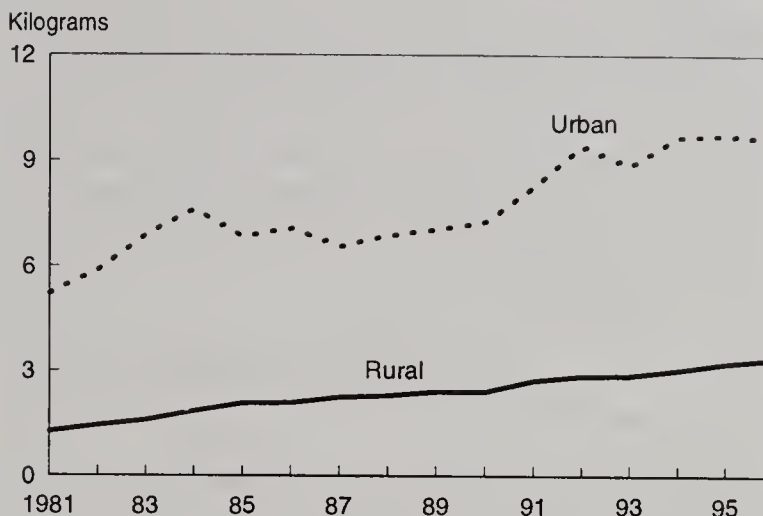
Urban fresh egg consumption rose from 5.2 kilos in 1981 to 9.6 kilos in 1996, an increase of 85 percent. Of total fresh eggs consumed in urban areas in 1996, 94.6 percent were chicken eggs, and the remainder were duck eggs. In 1996, urban consumers ate 2.8 times more fresh eggs than their rural counterparts (see fig. 16).

Poultry Meat Consumption: Increasing Trend

Urban household survey data indicate that per capita consumption of poultry meat (chicken, duck, goose, and other poultry) more than doubled from 1.9 kilograms in 1981 to 4

Figure 16

China's Rural and Urban Per Capita Consumption of Fresh Eggs



Source: China State Statistical Bureau.

kilos in 1996. In 1996 broilers accounted for 42.8 percent of poultry consumption. Live chickens (presumably spent hens) accounted for another 47.1 percent and live ducks made up the remaining 10.1 percent. Urban statistical workers also collected data on "other poultry products," which presumably included geese, doves, pheasant, quail, emu, and other poultry and probably included fresh, chilled, and frozen whole birds and poultry parts (see appendix A).

In 1981, urban residents consumed nearly three times more poultry meat than rural residents. But per capita consumption increased more rapidly in rural areas so that by 1996 urban residents were consuming only twice as much poultry as their rural cousins. (see fig. 17). Rural household survey data indicate that per capita poultry meat consumption rose from 0.71 kilos in 1981 to 1.93 kilos in 1996.

Poultry Meat and Eggs in Foreign Trade

China Is a Net Poultry Importer

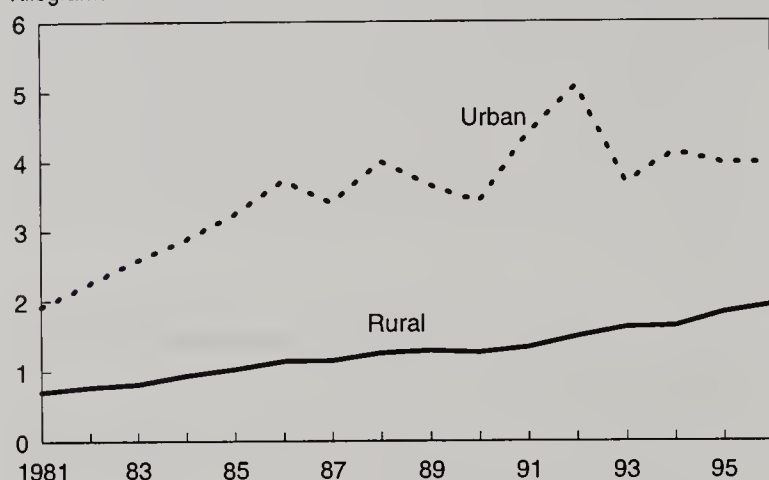
Even with a large increase in domestic poultry production, imports expanded from 68,000 metric tons in 1990 to an estimated 900,000 in 1997, making China a net importer of 465,000 metric tons of poultry products. Much of the increase came from the United States.

Any examination of poultry and egg exports to China has to include shipments to Hong Kong, because well over half of poultry and egg trade bound for China passes through this port. The exact figures for transshipments through Hong Kong are not always available, as some shipments are sent in ways to avoid China's import duties. As the economic ties between Hong Kong and China become even closer, it likely will become necessary to look at them as one market, with Hong Kong as the chief port in southern China. Starting in October 1997, the tariff on imported frozen poultry parts was

Figure 17

China's Rural and Urban Per Capita Consumption of Poultry Meat

Kilograms



Source: China State Statistical Bureau.

reduced from 45 percent to 20 percent. It is uncertain whether this will have any great impact on imports.

Large U.S. Poultry Exports To Hong Kong/China

In the 1990s, the growth in U.S. poultry and egg exports to Hong Kong and the rest of China was largely overshadowed by the huge growth in shipments to Russia. However, the greater China region is the second largest poultry and egg export market for the United States and expanded dramatically from \$93 million in 1990 to over \$500 million in 1997, with \$452 million shipped to Hong Kong and \$53 million going directly to China. In 1990, Hong Kong/China was the third largest market for U.S. broiler products at 178 million pounds, behind Russia and Japan. By 1997, shipments to this market had expanded to 875 million pounds,

nearly a fourfold increase. This made the Hong Kong/China region the United States' second largest export market for broilers, more than 3.5 times larger than the third largest market, Mexico.

China: Both an Importer and Exporter of Eggs

China is by far the world's largest egg producer, with 1997 production estimated at 336 billion pieces, more than double the next largest producer, India. Most of this production is consumed domestically. China does export about 1.1 billion eggs, with most going to Hong Kong. China is expected to remain a major supplier of table eggs to Hong Kong.

Eggs are one of the few poultry items where there is some trade both ways between the United States and the Hong Kong/China market. In 1997, the United States imported the equivalent of about 31 million shell eggs from Hong Kong/China, with a value of over \$4 million. Virtually all of the imports were in the form of shell eggs for human consumption. Only a very small amount (less than 1 percent) was in the form of egg products.

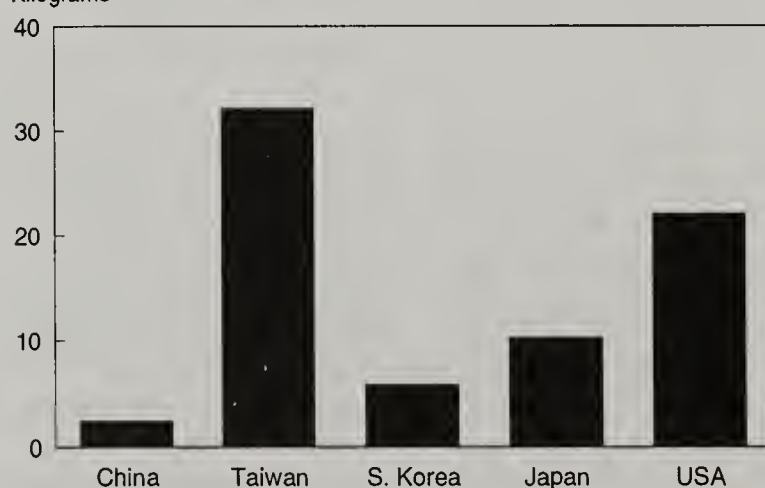
Through 1996, the Hong Kong/China region had been a steadily growing destination for U.S. shell eggs, but only a small market for egg products. By 1996, exports of shell eggs to Hong Kong/China had reached 636 million pieces. The Hong Kong/China market was by far our largest, accounting for almost 50 percent of shell egg exports in 1996. The shell egg shipments were composed almost entirely of eggs for consumption, as the total included less than 1 million dozen eggs for hatching. Total exports of shell eggs and egg products to Hong Kong/China in 1996 were valued at around \$34 million, about 16 percent of total U.S. egg and egg product exports.

The export picture changed dramatically in 1997, as over-supplies of eggs in China led to large exports to Hong

Figure 18

China's Per Capita Poultry Meat Consumption Compared with Selected Countries, 1995

Kilograms

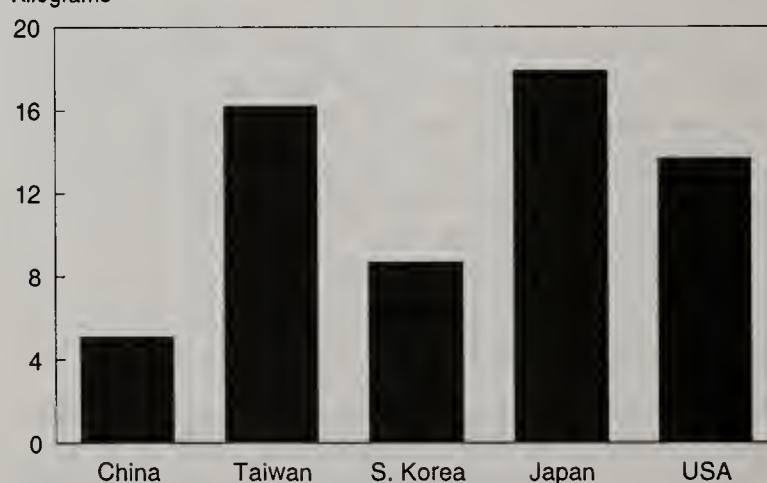


Source: USDA/ERS/MTED data base.

Figure 19

China's Per Capita Egg Consumption Compared with Selected Countries, 1995

Kilograms



Source: USDA/ERS/MTED data base.

Kong, reducing demand for egg imports from other areas, such as the United States. U.S. shipments of eggs to the Hong Kong/China market fell to 28 million dozen, down 47 percent from the previous year.

Poultry Disease Issues

In October 1997, there was an outbreak of avian flu among people in Hong Kong that eventually shut down the importation of live birds and poultry products from China. The outbreak brought Hong Kong's consumption of almost all poultry products to a virtual halt from late December 1997 through late January 1998. Not only did sales of live birds cease, but most restaurants also stopped selling poultry dishes, especially those with chicken products in them. Even though trade representatives were able to point out that frozen poultry parts from the United States did not have avian influenza, consumers in Hong Kong were reluctant to trust any poultry product. Although there have been no further cases since December, the return to pre-outbreak consumption levels is expected to take some time as consumers in Hong Kong and China slowly regain confidence in the safety of poultry products.

China's Export Obstacles

China has been very successful in expanding its exports of broiler products, and over the last decade has emerged as one of the world's largest poultry exporters. However, going into 1998 China's poultry industry faces four problems in trying to maintain export growth. First, due to sanitary regulations, mostly on the use of chlorine-based disinfectant sprays, China's poultry exports are shut out of the EU market. U.S. processors face the same barrier.

Second, the live bird market in Hong Kong will be smaller and more costly. The quantity of birds shipped live to Hong Kong was not expected to recover until at least the second quarter of 1998. In addition, the Hong Kong government now requires that live birds entering the territory be certified as free of the strain of influenza that caused the earlier scare.

Third, the impact of the scare has not been limited to Hong Kong. Countries such as South Africa and South Korea have banned imports of China's poultry until they are convinced that China's domestic flocks are free of avian influenza. Fourth, beginning in 1998, China fixed quotas on the amount of poultry products that can be exported.

Joint Venture Firms Involved in Poultry Exports

Many large-scale integrated poultry operations were developed starting in the 1990s, some as joint venture operations that combined domestic companies with outside investors, often foreign poultry companies.

For many of these joint venture operations the purpose was to serve not only the domestic market, but also to export

poultry products, primarily to Japan. Japan is an ideal market for several reasons. First, the proximity of Northern China allows China's processors to supply Japanese markets with fresh, chilled product in a way that some of its main competitors, the United States and Brazil, cannot match. Second, China's processors specialize in processed products. They supply hand-deboned broiler meat for use in restaurants, fast food outlets, and prepared meals, taking advantage of low labor costs. They export higher valued products while keeping lower valued products for domestic consumption. This segmentation dovetails with the traditional tastes of China's consumers, who prefer dark meat parts, wings and feet.

China's Poultry Industry Expected To Grow Modestly

Over the next decade poultry production and consumption in China likely will increase moderately. A continuing shift of tens of millions of people from rural to urban centers is anticipated over the next decades. Income elasticities for poultry meat and eggs are lower in urban than in rural areas, and city dwellers eat much more poultry meat and eggs than rural residents. Population growth and rural-urban migration will drive up consumption of poultry products. Poultry meat consumption will also grow in rural areas because the income elasticity for poultry meat is higher there (See appendix E for details).

Currently pork is the preferred meat in China. But if China is unable to increase grain and oilseed production to meet domestic feed requirements, the price for pork is likely to rise, because hogs are less efficient converters of feed into meat. A relative increase in pork prices would induce consumers to switch to poultry meat.

Members of the USDA's Broiler Team concluded that there did not appear to be a significant unmet demand for poultry meat. Indeed, urban poultry meat prices were falling during the team's visit in the spring of 1997. Future growth in egg and poultry meat production will be based on market forces, not government fiat.

In the past 5 years, China exported an average of 30,000 tons of eggs and just over 300,000 tons of poultry meat. The international egg and poultry meat market is very competitive and it remains to be seen how attractive China's products will remain.

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China's Aquatic Products Economy: Production, Marketing, Consumption, and Foreign Trade

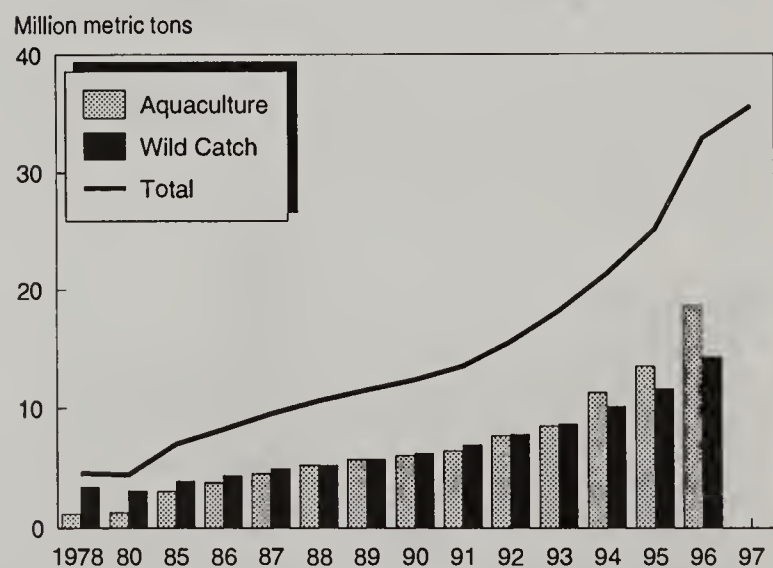
China is the world's largest aquatic producer, accounting for 20 percent of global production. Aquatic products, especially those produced by aquaculture, have become increasingly important in the food supply and household diet in China, accounting for 13 percent of total animal protein intake in 1995. In 1997, China produced more than 35 million metric tons of aquatic products. Inland aquaculture production exceeded 10 million metric tons in 1996, accounting for more than half of the world's freshwater aquaculture production [Zhi Wang (202) 694-5242].

China Is Top Aquatic Producer

During the 1970s, aquaculture production in China stagnated at about 4 million metric tons per year, or less than 5 kg per capita, far below the world average. Aquaculture refers to catches of artificially cultured, wild sea, and inland water products including fish, shrimp, crabs, and shellfish as well as seaweed, but excluding freshwater plants. Since economic reforms began in 1979, China's fishery industry has developed rapidly. Output of aquatic products has increased at an annual rate of 12 percent, much higher than the world average of 1.5 percent during the same period (table 27). The growth of aquacultural output was more dramatic than wild catch and now accounts for nearly 57 percent of the total aquatic output. Per capita aquatic production increased from 4.6 kg in 1980 to 23.5 kg in 1996, exceeding the world average. China ranked first in the world in terms of the annual output of aquatic products in 1996, accounting for more than 20 percent of world fishery production.

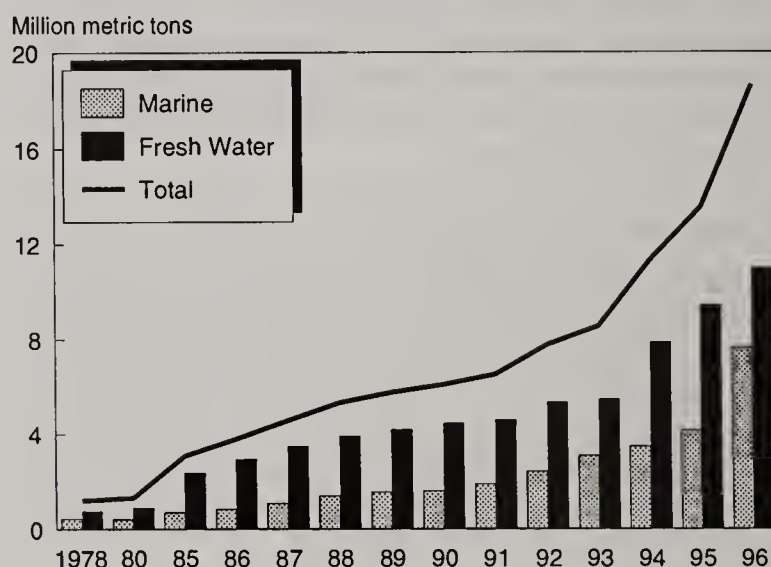
Within aquaculture, freshwater production increased more than 10 times, from less than 1 million metric tons in 1980

Figure 20
China's Fish Production



Source: State Statistical Bureau, China Statistical Yearbook, various issues.

Figure 21
China's Aquaculture Production



Source: State Statistical Bureau, China Statistical Yearbook, various issues.

to 11 million in 1996, accounting for 60 percent of total aquaculture output and making China the largest freshwater aquaculture producer in the world (about half of total world output). In the meantime, the efficiency of China's fishery production also increased. From 1986 to 1995, output per worker doubled from 1.1 to 2.7 metric tons, and output per hectare increased more than three times, from less than 1 metric ton per hectare to 3.3 (fig. 22). However, on average, marine aquaculture is more efficient than freshwater aquaculture, with an output of 9.3 metric tons per hectare, four times greater than freshwater aquaculture (table 27). This implies great potential for future productivity growth.

The rapid growth of fishery production in China during the reform period is the outcome of market-oriented economic reforms and appears consistent with China's resource endowments and relative comparative advantages. First, China is a land scarce economy using 9 percent of the world's arable land to feed more than 22 percent of the world's population. This number is calculated based on the estimate of China's

Table 27--Aquatic production in China, 1978-96

Year	Total	Output per capita	Aquaculture						Wild Catch			Labor Employed
			Total	Area	Marine	Area	Fresh	Area	Total	Marine	Fresh	
	Mil. tons	Kg	Mil. tons	Mil. ha	Mil. tons	Mil. ha	Mil. tons	Mil. ha	Mil. tons	Mil. tons	Mil. tons	Mil. people
1978	4.66	4.90	1.22	na	0.45	na	0.76	na	3.44	3.15	0.30	na
1980	4.50	4.60	1.34	na	0.44	na	0.90	na	3.15	2.81	0.34	3.10
1985	7.05	6.70	3.09	3.96	0.71	0.28	2.38	3.69	3.96	3.49	0.48	na
1986	8.24	7.72	3.80	4.05	0.86	0.33	2.94	3.72	4.43	3.90	0.54	7.31
1987	9.55	8.81	4.57	4.16	1.10	0.37	3.47	3.79	4.98	4.38	0.60	7.99
1988	10.61	9.63	5.32	4.25	1.42	0.41	3.90	3.84	5.29	4.63	0.65	8.54
1989	11.52	10.30	5.75	4.24	1.58	0.42	4.17	3.81	5.77	5.04	0.74	8.78
1990	12.37	10.90	6.08	4.26	1.62	0.43	4.45	3.83	6.29	5.51	0.78	9.09
1991	13.51	11.74	6.50	4.32	1.91	0.45	4.59	3.87	7.01	6.10	0.92	9.23
1992	15.57	13.37	7.76	4.48	2.42	0.50	5.33	3.98	7.81	6.91	0.90	9.66
1993	18.23	15.47	8.53	4.75	3.09	0.59	5.44	4.16	8.70	7.67	1.03	10.01
1994	21.43	17.98	11.31	5.10	3.46	0.65	7.85	4.45	10.12	8.96	1.17	10.84
1995	25.17	20.89	13.53	5.39	4.12	0.72	9.41	4.67	11.64	10.27	1.37	11.43
1996	32.88	23.53	18.63	5.68	7.64	0.82	10.99	4.86	14.25	12.49	1.76	12.08

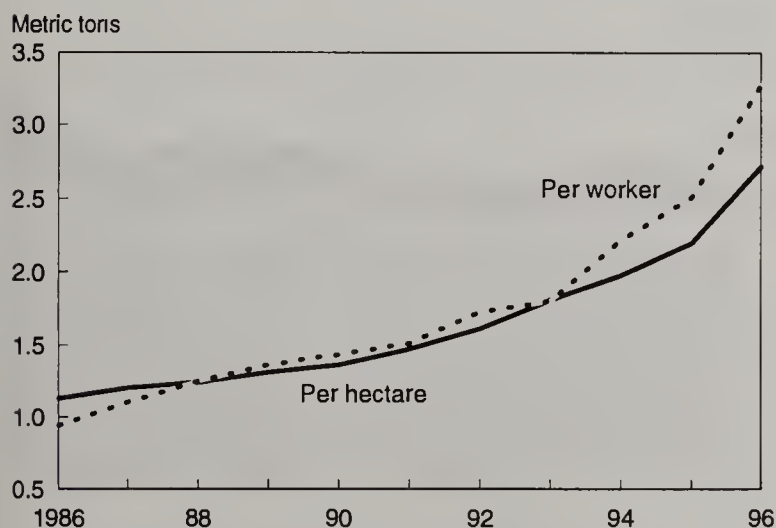
na = Not available.

Data source: China Statistical Yearbook, various issues, State Statistical Bureau of People's Republic of China.

Based on FAO Fisheries Department, China's fishery production statistics have been understated because the live weight conversion factor used, and in 1998 FAO, in consultation with Chinese Ministry of agriculture, will adjust Chinese and global aquaculture production statistics.

arable land made by USDA/ERS (2), which is about 40 percent higher than the number reported by SSB. It is a great challenge for China to secure an adequate food supply for its growing population, especially with the increasing demands for food during rapid industrialization. Among different types of food production in China, some fishery operations do not compete for land with feed grain production and pasture for grazing animals. Moreover, fish are more efficient in converting feed to meat than other animals. The conversion ratio of feed to animal weight is 1.3-1.5 for fish, 2.6-2.8 for chickens, and 3.0 for pigs (1). Aquaculture may reduce the pressure on arable land and feed grain demand during China's rapid industrialization.

Figure 22
China's Productivity Growth in Aquaculture



Source: Calculated by the author from State Statistical Bureau, China Statistical Yearbook, various issues.

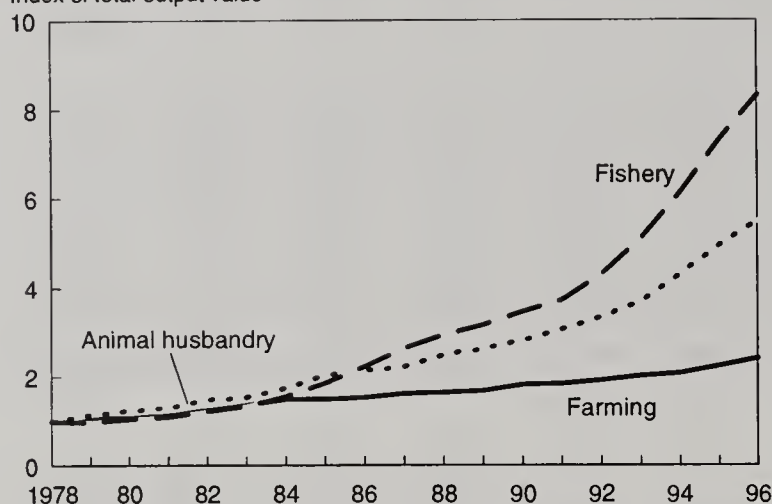
Second, fishery production, especially fresh water aquaculture, is more labor intensive than grain production (4). There is a large amount of hidden unemployment in China's agricultural sector (the surplus is estimated at 175 million [3]). Transferring this labor to other economic activities will be one of the most difficult tasks of China's modernization. Aquaculture is one way to transfer agricultural labor. The labor force working in the fishery industry increased from 3.1 million in 1980 to 12.1 million in 1996 (table 27). This equals nearly 9 percent of the agricultural labor force transferred to rural enterprises during that period, among which more than 7 million went to aquaculture. This not only alleviated the pressure of the increasing conflict between abundant labor and scarce arable land, especially in the south part of China, but also raised farmers' income. A farmer in the fishery industry earns more than farmers in other agricultural sectors (the income ratio was 2.1:1 in 1995 [5]), especially compared with those who work in grain production.

As the government adopts more liberal policies in rural areas and gives farmers more freedom of choice in what to produce, there are great incentives for farmers to change from grain production to fishery production. Fig. 23 plots the index of gross output value for the three major food production sectors in China since the economic reform started. It shows clearly that before 1984 the fishery industry grew at the same pace as the crop sector (about 6 percent a year). However, as reforms deepened and extended from rural into urban areas, fishery production growth accelerated to an annual rate of 15 percent. This is the result of resource reallocation by market forces and it greatly contributed to the efficiency of China's food production as a whole (See appendix B for details).

Figure 23

Growth of China's Major Food Production Sectors

Index of total output value



Source: State Statistical Bureau, China Statistical Yearbook, 1995, p356.

The Development of Marketing Systems For Fishery Products

Prior to 1980 aquatic products were classified as Category II products and were subject to central economic planning measures (see appendices B and D). Some fishery products were rationed in urban areas. As China's market-oriented economic reforms progressed and aquatic output increased, the marketing of fishery products changed rapidly.

Currently, the marketing system consists of wholesale markets and retail channels such as direct marketing, commission and auction traders, and private retailers for brand name species. Ordinary freshwater fish products are mainly marketed by private retailers in local markets, while in large urban centers state-owned department stores still retail most of the aquatic products.

The rapid development of wholesale markets brought prosperity to the aquatic product economy. The volume of transactions in wholesale markets reached 2.3 million tons in 1997, up 25 percent from 1996. Commission and auction trading is gradually becoming a major marketing channel for a large part of the wholesale market in China.

Aquatic Products Are Fastest Growing Portion of Animal Protein Diet

Before the economic reforms, aquatic products were generally considered luxury items in China. However, since 1978, consumption of fishery products by households has increased steadily because of the growing domestic supply, increases in household income, and rising living standards (See appendix A for details).

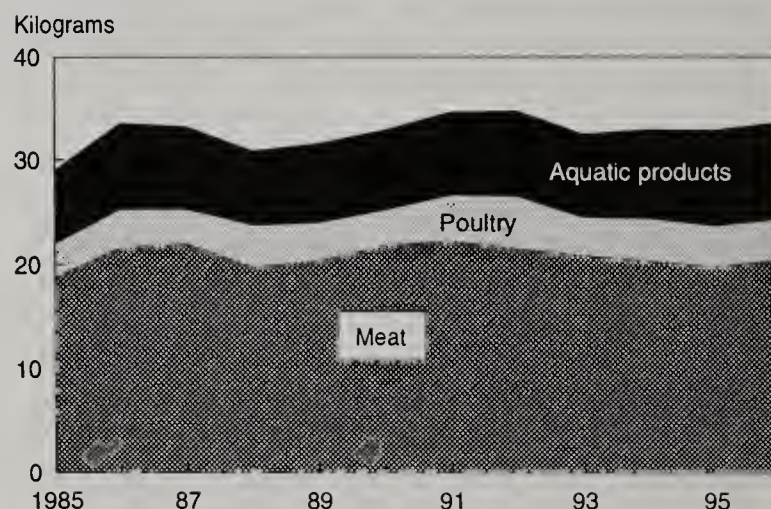
From 1985 to 1996, per capita total meat consumption (pork, beef, mutton, poultry meat, and fish products) increased 15 percent for urban households and 33 percent for rural households. During the same period, fish product

consumption increased 30 and 105 percent, respectively, constituting more than 43 percent of the total gains and making aquatic products the fastest growing portion in both urban and rural households' animal protein consumption.

It is interesting to note that while meat consumption by urban households has actually declined since 1991, fish consumption increased steadily (fig. 24). In rural areas, meat consumption also declined since 1990 (fig. 25), while the consumption of fish and shrimp products increased about 58 percent during 1991-1995. In some large cities such as Guangzhou, the consumption of aquatic products even exceeded the consumption of other meat.

Figure 24

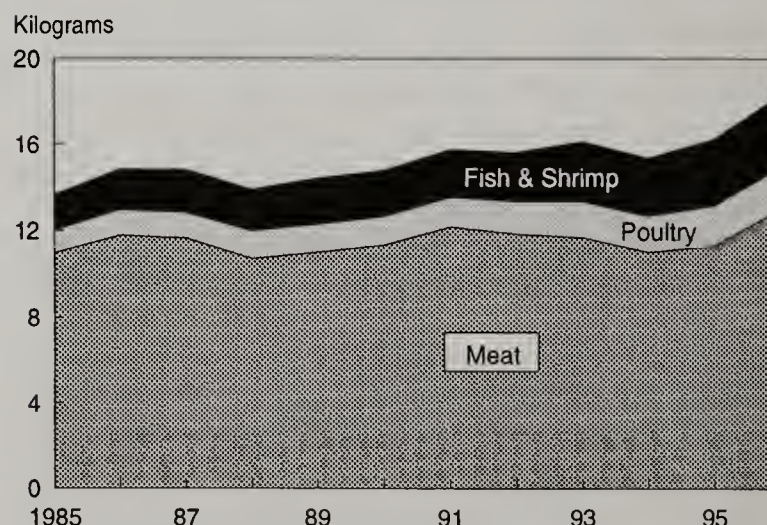
China's Urban Resident Per Capita Meat Consumption



Source: State Statistical Bureau, China Statistical Yearbook, various issues.

Figure 25

China's Rural Resident Per Capita Meat Consumption

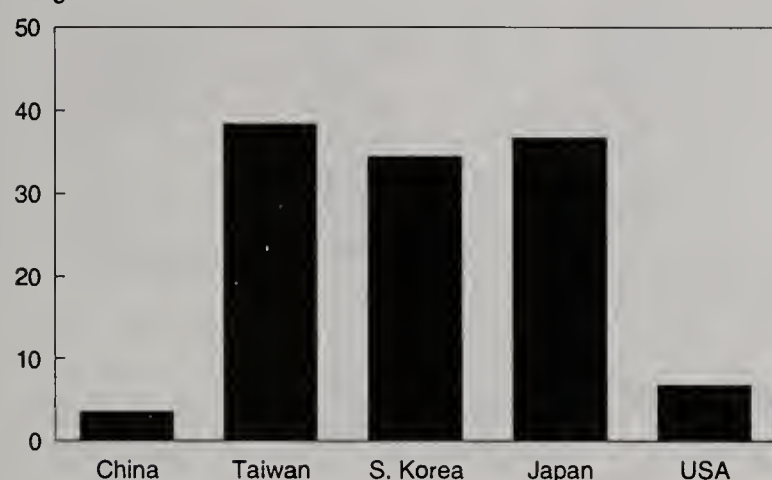


Source: State Statistical Bureau, China Statistical Yearbook, various issues.

Figure 26

China's Per Capita Fish Consumption Compared with Selected Countries, 1995

Kilograms



Source: USDA/ERS/MTED data base.

Obviously, significant contributions have been made by the fishery industry to the food supply in China. The diet of both rural and urban households has improved, with the increase in protein coming from fishery products.

However, the expansion of fishery product consumption in the early 1990s cannot be explained by the increase in household income alone. In fact, it was a combined result of income and substitution effects (with more supply available). From 1991 to 1995, China suffered from inflationary pressures, especially rapid price increases for food products. The price increase for aquatic products was much slower than that of other foodstuffs, especially compared with the price of red meat, poultry, and eggs. For example, as shown in table 28, the consumer price index for red meat, poultry, and eggs increased more than 40 percent in 1994 and more than 25 percent in 1995, but for aquatic products it rose only 20 percent and 13 percent. From 1990 to 1996, the price of other protein food products increased 15 percent more than fishery products in urban areas, 40 percent more in rural areas, and 30 percent more nationally. The high prices for

meat and low prices for fish caused households to consume more fishery products relative to other meat products.

In 1995, urban households allocated about a half of their living expenditure to food, 23 percent of which was spent on red meat and poultry, while nearly 7 percent was spent on aquatic products. The Engel coefficient varied significantly by household income level, from 0.4 for the richest urban households to 0.61 for the poorest urban households.

Meanwhile, the proportion of food expenditure spent on meat and fishery products was quite stable, varying within a 1-percent range, which indicates that such products were no longer luxuries in urban household budgets (expenditure elasticity less than one, see table 29).

The share of household living expenses spent on aquatic products showed more variation by households living in different geographic locations in China. On average, the share of fishery products in urban household food expenditures was 7 percent. This share ranged from only 2 percent in inland provinces such as Shanxi and Shaanxi, to 14-15 percent in southeast coast provinces such as Shanghai and Zhejiang (see table 30). In terms of quantities consumed, the variations among rural households living in different provinces were more significant, ranging from more than 12 kg per capita in south coast provinces such as Guangdong to less than 0.1 kg per capita in inland provinces such as Shaanxi. The significant variation among different regions implies there is a great market potential for fishery products as China's rapid economic growth continues in the years to come.

China's Trade in Fishery Products

As China's production of aquatic products expanded rapidly in recent years, its fishery trade with the world also increased dramatically. Fishery is a net export sector in China, generating \$2-\$3 billion in hard currency each year since the late 1980s. Total fishery exports have increased more than four times since 1980 (fig. 27). China's share in world fishery production and trade has increased steadily (fig. 28). Its output share increased from about 6 percent of

Table 28--Consumer price indexes, China, 1990-97

Year	Rural		Urban		Nation	
	Meat, eggs poultry	Aquatic products	Meat, eggs poultry	Aquatic products	Meat, eggs poultry	Aquatic products
1990=100						
1990	100.0	100.0	100.0	100.0	100.0	100.0
1991	96.9	98.7	98.3	103.1	97.7	101.5
1992	100.7	103.4	103.6	109.1	102.4	107.0
1993	112.9	116.8	119.4	129.2	116.7	124.4
1994	156.2	139.4	162.4	156.4	160.1	150.2
1995	194.5	159.9	201.6	178.0	198.9	171.5
1996	207.3	167.5	214.1	189.2	211.6	181.1
1997	na	na	na	na	223.3	181.5

na = Not available.

Data source: China Statistical Yearbook, 1994 and 1995, State Statistical Bureau of People's Republic of China.

Table 29--Per capita food expenditures by different income groups, urban households in China, 1995

	Average	Lowest income	Low income	High income	Highest income
	RMB				
Total expenditure	3,537.57	2,060.96	2,516.22	4,665.91	6,033.10
Food	1,766.02	1,266.06	1,462.42	2,127.00	2,440.91
Meat and poultry	416.27	286.72	349.33	496.70	550.08
Eggs	69.58	52.48	62.48	78.61	86.78
Milk and dairy	31.43	16.38	21.40	41.68	49.64
Aquatic products	120.64	76.66	97.31	147.07	172.67
	(4.73Kg)	(3.37Kg)	(3.91Kg)	(5.44Kg)	(6.12Kg)

Data source: China *Statistical Yearbook*, 1995, State Statistical Bureau of People's Republic of China.

Table 30--Per capita food expenditures of China's households, by geographical locations, 1995

	Average	Guangdong	Shanghai	Zhejiang	Shanxi	Shaanxi
	RMB					
Urban households						
Total expenditure	3,537.57	6,253.68	5,868.11	5,263.41	2,640.73	2,837.69
Food	1,766.02	3,003.05	3,120.33	2,476.21	1,267.17	1,339.57
Meat and poultry	416.27	903.06	678.92	502.34	213.63	237.38
Aquatic products	120.64	351.77	442.30	376.06	26.89	26.33
Rural households						
Total expenditure	1,310.36	2,255.01	3,387.04	2,378.38	927.99	913.73
Food	768.19	1,228.00	1,491.40	1,197.97	586.03	542.02
Meat and poultry (Kg)	13.12	25.02	18.14	17.18	4.57	4.95
Fish and shrimp (Kg)	3.36	12.04	9.91	11.43	0.31	0.09

Data source: China *Statistical Yearbook*, 1994 and 1995, State Statistical Bureau of People's Republic of China.

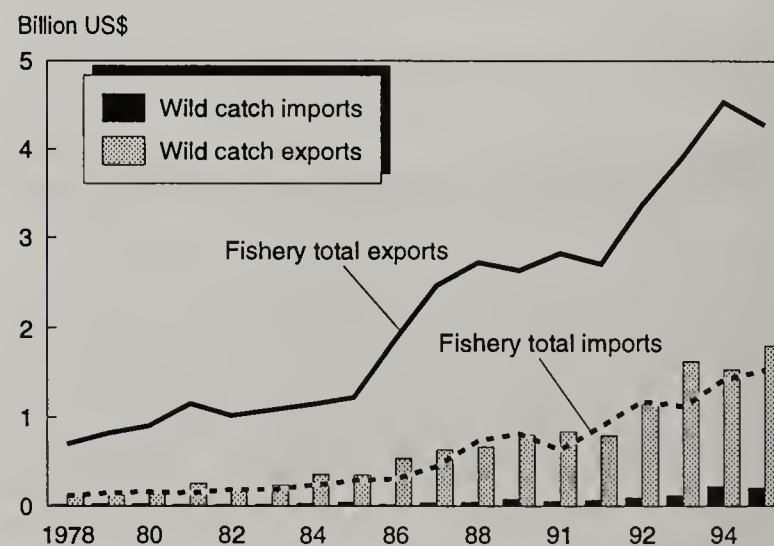
world production in the early 1980s to more than 20 percent in the mid-1990s.

China also became a major trading power in world aquatic markets. Its exports accounted for more than 11 percent of the world market in 1995. An interesting feature of China's fishery trade is that its value share in world exports is consistently higher than its quantity share, but its value share in world imports is consistently lower than its quantity share. This indicates that China exports relatively higher-valued fishery products but imports relatively lower-valued products. One reason is that China usually imports a large amount of fishmeal as animal protein feed and exports high-valued shrimp to developed country markets.

The United States has run a \$200 million deficit with China in aquatic product trade in recent years (figs. 29 and 30). U.S. imports of fishery products from China increased dramatically from less than \$50 million in 1985 to more than \$400 million in 1992 but have declined to about \$300 million a year since then. U.S. imports from China dropped in 1993 when shrimp production declined sharply due to disease in South China. China had to import rather than export shrimp that year, and China's shrimp production did not return to its peak level until 1996.

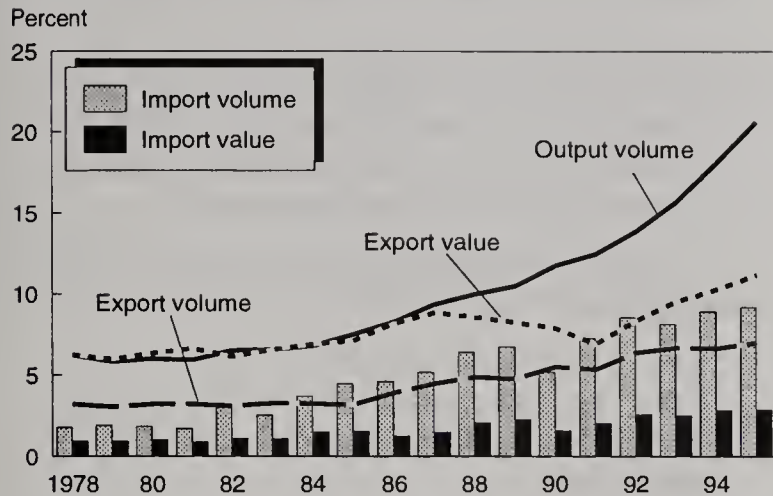
Before 1993, more than 80 percent of U.S. fishery imports from China were shellfish (mostly shrimp), but since then the share has fallen and fresh and prepared fishery products were almost 50 percent of total U.S. imports from China in 1996 (figure 30). U.S. fishery exports to China increased

Figure 27
Aquaculture Dominates China's Trade in Fishery Products with the World



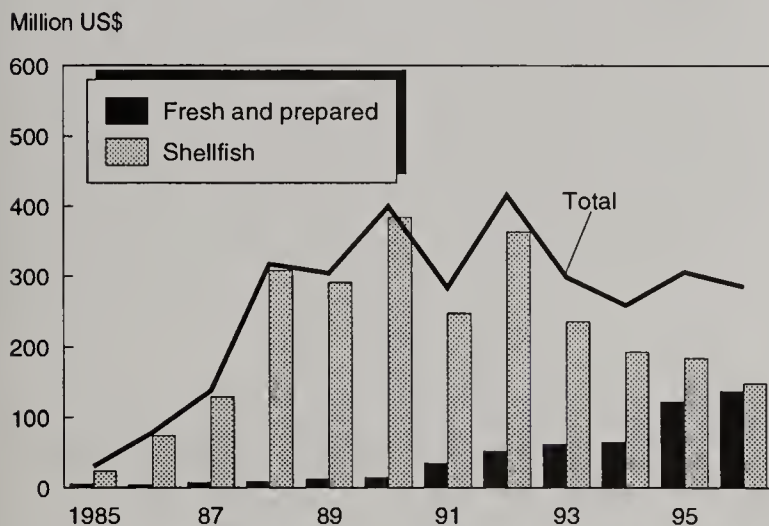
Source: FAOSTAT Database, 1997.

Figure 28
China's Share of World Aquaculture Production and Trade



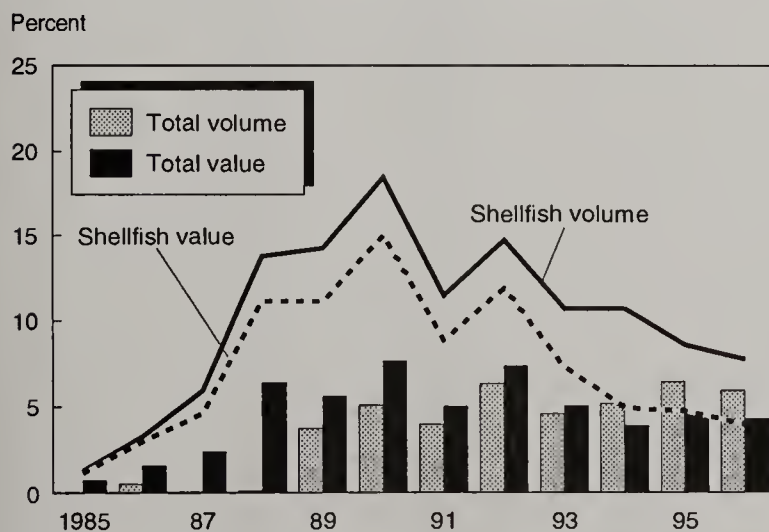
Source: FAOSTAT Database, CD-ROM, 1997

Figure 29
U.S. Fishery Imports from China



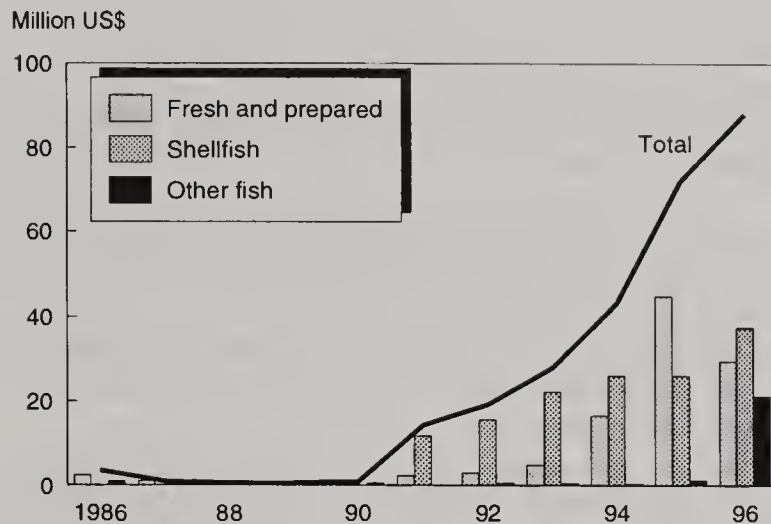
Source: USDA, Foreign Agricultural Trade of the United States (FATUS).

Figure 30
China's Share of Total U.S. Fishery Imports



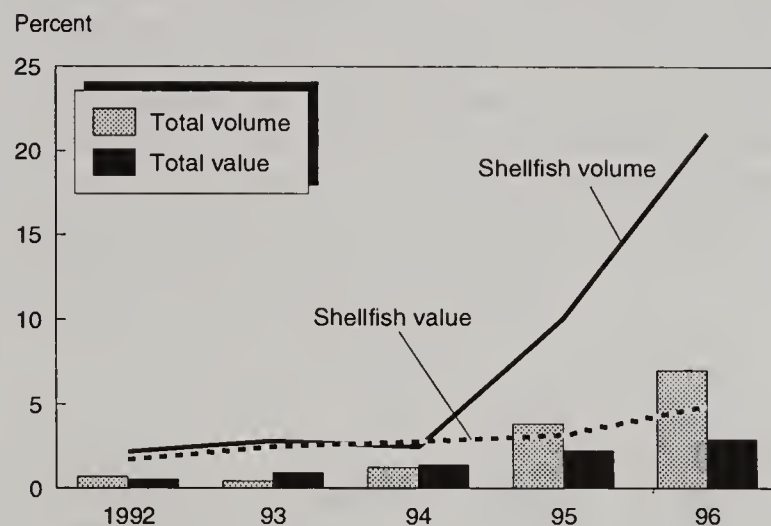
Source: USDA, Foreign Agricultural Trade of the United States (FATUS).

Figure 31
U.S. Fishery Exports to China



Source: USDA, Foreign Agricultural Trade of the United States (FATUS).

Figure 32
China's Share of Total U.S. Fishery Exports



Source: USDA, Foreign Agricultural Trade of the United States (FATUS).

sharply from less than \$5 million 1990 to nearly \$90 million in 1996 (figs. 31 and 32). Accordingly, China's share in U.S. total fishery exports increased from less than 1 percent to 7 percent in quantity terms and 3 percent in value terms. Although China only takes a small share of U.S. fishery exports, it is an important market for U.S. shellfish exports. It took more than 20 percent of U.S. shellfish exports in quantity terms and 5 percent in value terms last year, indicating it is a major low-grade shellfish market for the United States.

Future Trends in China's Fishery Economy

China has the capacity to increase aquatic production. Fisheries will likely continue to be the fastest growing sector of China's agricultural economy during the next decade, although a shortage of water supplies in North China, water pollution in Central and South China, and the spread of dis-

eases in pond fish and shrimp may slow the pace of growth. China's government plans to increase aquatic production by at least 10 million metric tons during the ninth five-year plan period (1996-2000), increasing China's total aquatic output to over 35 metric tons per year by the year 2000. Aquaculture will make up 85 percent of the increase (see appendix E for details).

The proportion of aquaculture in total fishery industry output will be raised from less than 55 percent in 1995 to more than 60 percent in 2000, with fisheries making up 13 percent of the total gross output value of China's agricultural production. Accordingly, 3.5 million hectares of coastal and inland waters will be developed into aquaculture fields. Some 129 development projects have been initiated along the coastline, mostly in an effort to improve port infrastructure and handling facilities for fishery products. In the meantime, yields will also increase through better technology and research.

Since world fisheries are overexploited, future increases in China's aquatic production will come primarily from aquaculture (1). Aquaculture production will likely make a significant contribution to China's per capita protein consumption and food security during next century. This will have a significant impact on U.S. exports of feedstuffs and other meats to China.

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China's Dairy Economy: Production, Marketing, Consumption, And Foreign Trade

China's residents consume less than 2 kilograms of milk products per year, which places them near the bottom in world rankings of per capita milk consumption. Per capita milk consumption likely will rise slowly in the coming decade. China may not have a comparative advantage in milk production and may choose to import product rather than boost domestic production.

[Frederick W. Crook (202-694-5217)]

Few Milk Drinkers in China

Beginning well before 200 B.C., Han ethnic peoples occupied and cultivated the plains in North China. They did not develop a strong tradition for consuming milk products. The consumption of dairy products was much more widely developed among the Mongol, Manchu, Uygurs, and Zang peoples who occupied the grassy plains in China's northwest, west, and northeast areas. These historical trends continued into the last half of this century. But after reforms in 1979, milk output in China increased rapidly, and milk products are now more readily available to residents in large urban centers. Statistical books report total milk output and cow milk production. The difference between total and cow milk figures is assumed to be mostly goat milk, but could also include milk from horses, camels, and yaks (see table 31).

Government Policies Stimulated Milk Production

In 1973 China produced 888,000 tons of milk. But by 1997 output increased more than eight times to 7.7 million tons. During the "food basket" period from 1988 to 1997, milk production grew an average of 7.9 percent a year. In 1997 milk supplies were greater than demand and serious overstocking occurred (1).

Over the past two decades cows' milk accounted for roughly 87 percent of total milk output. Goat (and other) milk as a percentage of total milk output varied from 9.2 percent in 1973 to 18.1 percent in 1979, but averaged 13 percent for the whole period. Output has grown steadily from 82,000 tons in 1973 to just over 1 million in 1996.

Table 31--China's supply and use of fluid milk, 1980-98

Year	Cow milk	Total production	Imports	Exports	Domestic consumption	Fluid use	Factory use	Other milk production
1,000 tons								
1980	1,141	1,367	0	0	1,367	817	550	226
1981	1,291	1,549	0	0	1,549	929	620	258
1982	1,618	1,959	0	0	1,959	1,179	780	341
1983	1,845	2,219	0	0	2,219	1,329	890	374
1984	2,186	2,596	0	0	2,596	1,609	987	410
1985	2,499	2,894	0	0	2,894	1,968	926	395
1986	2,860	3,275	0	0	3,275	2,194	1,081	415
1987	3,301	3,788	0	0	3,788	2,688	1,100	487
1988	3,660	4,181	0	19	4,162	2,282	1,880	521
1989	3,813	4,334	0	20	4,314	2,510	1,804	521
1990	4,157	4,751	2	19	4,734	2,834	1,900	594
1991	4,646	5,243	1	22	5,222	3,145	2,077	597
1992	5,031	5,639	4	25	5,618	3,100	2,518	608
1993	4,990	5,640	5	27	5,618	3,118	2,500	650
1994	5,288	6,089	5	26	6,068	3,338	2,730	801
1995	5,764	6,728	7	25	6,710	3,510	3,200	964
1996	6,296	7,359	15	25	7,349	3,928	3,421	1,063
1997	6,650	7,650	18	25	7,643	4,143	3,500	1,000
1998	7,000	8,000	20	25	7,995	4,495	3,500	1,000

Source: USDA, P S and D, April 1998.

A number of factors spurred the rapid development of China's dairy industry. First, in pre-1949 China, modern dairies had been established in the outskirts of China's major cities. Also, farmers in China's northeast, northwest, and west had experience with milk-producing animals. Dairy operations were not completely new to China's authorities (See appendix B for details).

Second, in the mid-1970s the government used state farms (wholly government-owned farms), some of which were located on the outskirts of major urban centers, to establish fairly large scale dairy farms and associated milk processing plants. For example, the "Eighth Five Year Plan" (1991-1995) goals called for milk production to expand with increases coming from state farms and dairy farms in suburban areas (See appendix C for details).

Third, rural reforms initiated in the early 1980s contracted land to individual farm households and opened up rural free markets. With urban incomes and demand for non-staple food products rising, farm households found it profitable to begin raising milk cows and goats. Collective and government institutions purchased and processed the milk from the individual farm households.

Fourth, Party and government leaders in the mid-1970s had a goal to improve urban living standards. Part of this effort to improve the variety of the urban diet included increasing the supply of dairy products. By 1988, the central government promoted the "food basket" program which encouraged the mayors of medium and large sized cities to seek ways to expand output of vegetables, fruits, poultry meat, pork, eggs, and milk (See appendix D). In the "Ninth Five Year Plan" (1996-2000), government planners outlined investment programs and administrative procedures to expand milk output. Milk production goals have been set at 7.8 million tons for the year 2000 and an ambitious 17 million tons for the year 2010.

Fifth, a number of international organizations and foreign governments have provided technical assistance and aid. For example New Zealand has some cooperative dairy projects with China. The European Union granted aid to purchase dairy cows and upgrade dairy processing plants in Gansu province. The United Nations World Food Program supported a dairy improvement project in Tibet.

A survey of dairy operations conducted by the China Dairy Cattle Association in 1994 found that there were about 3,000 state-owned dairy farms that produced about 25 percent of total milk output. Collectively owned dairies with 100 cows per farm accounted for another 15 percent of total output. There were some 300,000 farm households that raised 2 to 3 cows each and produced about 60 percent of total milk output.

Government-Owned Entities Involved in Milk Marketing and Processing

Government authorities currently are promoting the growth of milk production and the expansion of marketing services between farmgate and consumers as a means to improve employment opportunities in rural areas and to boost rural income.

Mayors Intervene in Milk Markets

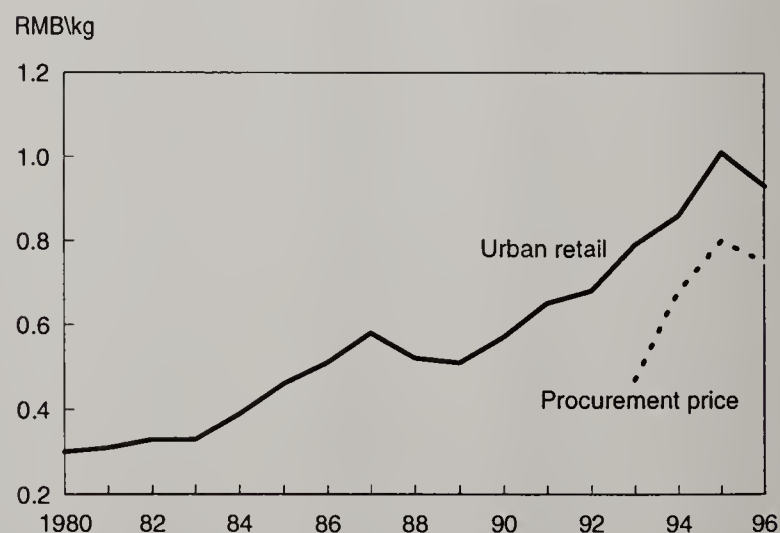
Since the mid-1950s milk has been classified as a category III product. Beijing leaders claim that government control of milk marketing has been "deregulated." But we also know that in urban areas milk was rationed. Moreover, milk is a major product included in the "food basket" program and as such, city mayors continue to find ways to subsidize suburban dairy operations.

The rural household sample survey teams found that in 1991 the average farm household in China produced 15.1 kilos of milk per year, sold an average of 9 kilos and had an average on-farm consumption of 6 kilos. Farmers in the western portion of China clearly produced most of their milk for on-farm consumption and sold only a small portion. On the other hand farmers in Heilongjiang sold most of the milk they produced.

Milk Prices Rising

The State Planning Commission, Price Bureau, publishes data on retail prices for 35 large metropolitan areas. Typically it reports monthly prices for fresh milk (Price Bureau). Urban retail and procurement prices published in China are given in RMB per kilogram, and the "General retail price index" is used to deflate the price series. Procurement prices usually indicate government purchases

Figure 33
China's Real Urban Retail Fresh Milk Prices



1978=100.

Source: USDA/ERS/MTED data base. China Price Bulletin, various issues.

either through mandatory sales or a government offer price in open markets.

The urban retail price for fresh milk tripled from 0.3 RMB per kilogram in 1980 to 0.93 RMB in 1996. Prices increased steadily until 1988, after which real prices fell in 1989 and 1990, but then continued to rise until falling in 1996 (see fig. 33). More research is needed to determine why real milk prices rose in the last two decades. The USDA/FAS Agricultural Attache in Beijing reported that the procurement price for fresh milk has been increased substantially in recent years. We believe the mayors of some cities use support prices to encourage dairy farmers to keep producing milk when market prices fall and profit margins are squeezed.

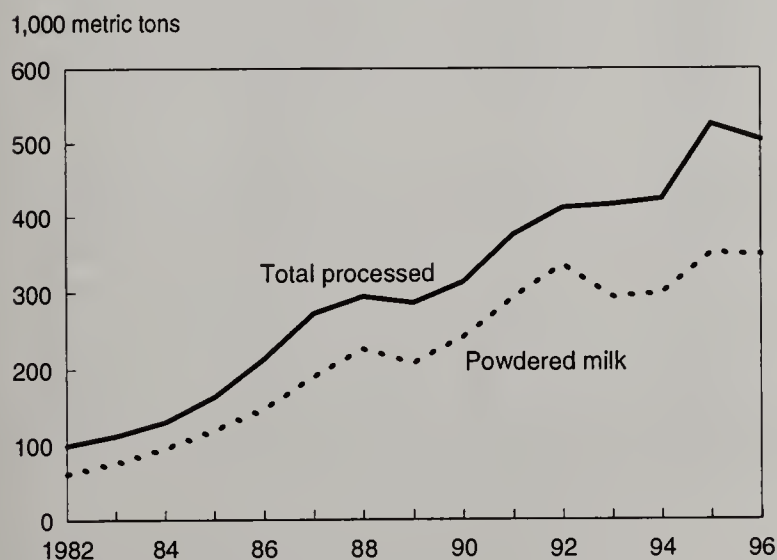
Milk Processing Capacity Expanding

Before 1949, China had only a few milk processing plants that were located in big cities like Beijing, Tianjin, and Shanghai. By 1982 China had about 500 milk processing plants with a daily capacity of 4,000 tons and an annual output of 997,000 tons. In 1996 China had roughly 700 dairy processing plants. Ice cream plants have expanded rapidly in the last decade. A number of joint venture firms have built plants in big cities. These include Kraft in Beijing (yogurt), Baskin-Robbins in Beijing (ice cream), Borden in Heilongjiang (powdered milk), Dannon in Tianjin (yogurt), and infant formula plants in Shanghai and Canton.

Per Capita Milk Consumption Remains Low

Milk consumption data for both urban and rural consumers have been published for only the past 6 years (1991 through 1996). Urban residents consumed six times more fresh milk than those in rural areas. Urban residents consumed most of their milk in fluid form and a large portion of fluid milk is consumed by sick, feeble, and young people. Cheese con-

Figure 34
China's Processed Milk Product Output



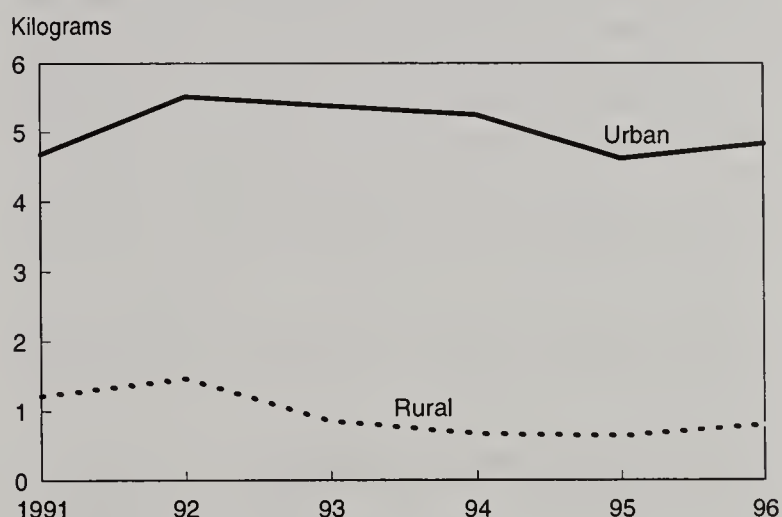
Source: China State Statistical Bureau.

sumption is very low but sales of ice cream and frozen dairy products are increasing very rapidly, albeit from a very small base. Urban residents consumed an average of a little over 6 kilos of milk compared with 0.94 kilos for rural residents. Per capita consumption in both urban and rural settings rose from 1991 to 1992, but has declined since then (fig 35).

Milk Products Not a Big Item In Foreign Trade

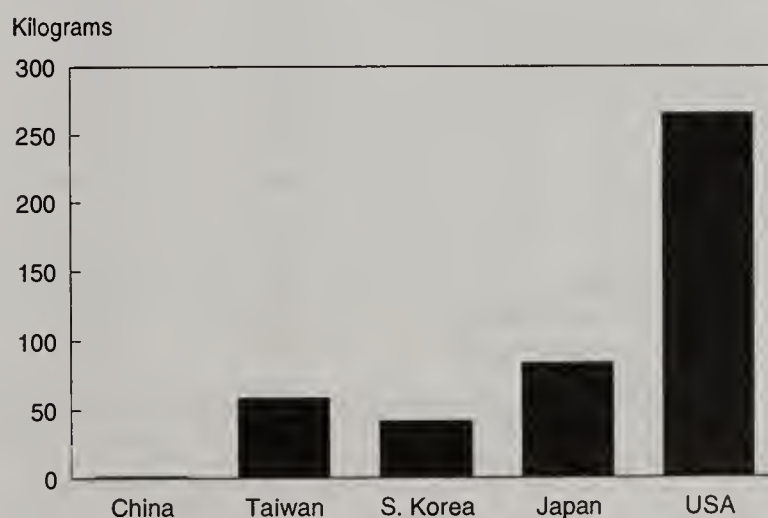
Dairy products play a minor role in China's overall agricultural trade. In 1995 dairy exports of \$27 million accounted for 0.23 percent of China's total agricultural exports. China exported over \$16 million of fluid milk, mostly to Hong Kong, and nearly \$6 million of dried milk powder. In 1995 dairy product imports totaled \$58 million but accounted for

Figure 35
China's Rural and Urban Per Capita Consumption of Fresh Milk



Source: China State Statistical Bureau.

Figure 36
China's Per Capita Milk and Milk Product Consumption Compared with Selected Countries, 1995



Source: USDA/ERS/MTED data base.

0.52 percent of total agricultural imports. Dried milk powder accounted for \$26 million of the total while whey imports for feed use made up \$16 million. Dairy products are subject to licensing requirements or quotas. A 17-percent value-added tax is placed on all milk products imported into the country (CIF plus tariff duties). Tariffs on the various products are given in table 32. The tariff on milk powder was reduced from 30 to 25 percent on October 1, 1997.

China's Dairy Industry Expected To Grow Slowly

Over the next decade milk production and consumption in China likely will increase slowly (see appendix E for details). Urban consumption patterns suggest that urbanites eat more dairy products than rural residents. The growth in population and shifts in where residents dwell likely will stimulate demand for dairy products. Milk is not a preferred protein food in China. Feed grain and oilseed meal shortages in the decades to come likely will mean higher production costs for domestically produced milk and milk products. Although there is some potential in the next decade or two to expand grassland-based dairy operations in the hilly areas in South China, high milk prices likely will discourage consumption. For example, as urban milk prices rose in the 1990s, urban milk consumption remained flat. On the other hand, ice cream and frozen dessert consumption has risen sharply in the last decade and likely will continue to expand.

Domestic producers may have some advantages in the fluid milk market. But producers of powdered milk and ice cream

likely will face stiff competition from other countries. Several USDA studies of China's agricultural economy in 2005 to 2025 forecast that feed grain and oilseed meal production will increase, but the demand for feed and oil meals will outpace supplies and there likely will be an increasing gap between supply and demand. With increasing tightness in domestic feed grains and oil meal supplies one would expect producers to implement efficiency measures to save on scarce feed supplies. Grain farmers can produce four to six times as many calories per unit of farmland than dairy farmers can on the same unit of land. China's farmers have had to struggle mightily in this century to provide adequate calories to keep its citizens alive. It is not surprising then that given the choice between many calories from grain and much fewer calories from milk, China's farmers have opted for grain. This fundamental condition in China's population and land resource situation may also prove to be a compelling argument for China's leaders to encourage very efficient domestic dairy production and rely on imports to satisfy domestic dairy product demand.

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Table 32--China's dairy product imports, 1992-95

Item	Codes	Tariff rate 1/ Percent	Imports			
			1992	1993	1994	1995
			Tons			
Milk, fluid, less than 1%	4011	30/40	1,865	1,585	1,900	2,299
Milk, fluid, 1 to 6%	4012	30/40	1,865	2,399	1,753	2,467
Milk, fluid greater than 6%	4013	30/40	273	896	1,704	2,673
Milk, dried, n/ov less than 1.5%	4021	30/40	6,263	6,444	20,377	9,490
Milk, dried, ov 1.5%, b/fat n/sugar	40221	30/40	4,908	2,571	9,499	9,695
Milk, nes, dried over 1.5%	40229	30/40	4,360	6,729	12,921	5,542
Milk, nes, evap/cond, n/sugar	40291	30/40	773	784	556	476
Milk, nes, evap/cond, sweetened	40299	30/40	551	1,147	1,023	649
Yogurt	4031	65/90	346	810	689	188
Buttermilk	4039	65/90	218	429	1,196	1,062
Whey	4041	7/30	20,766	15,391	28,925	34,245
Whey, nes	4049	65/90	112	906	126	360
Butter	405	65/90	1,548	1,736	2,195	1,181
Cheese, curd, fresh	4061	65/90	9	11	16	16
Cheese, grated and powdered	4062	65/90	218	49	749	1,270
Processed cheese, not grated	4063	65/90	136	0	528	258
Cheese, cheddar	4069	65/90	82	114	286	315

1/ The first rate shown is for "Most Favored Nation" status and the second is for other countries.

Source: *Custom Yearbook*, 1991-1995. (2).

Concluding Observations

China is the world's largest producer and consumer of most livestock meat products. However, due to China's enormous population, per capita animal protein intake is much lower than its neighbors'. For example, citizens in South Korea eat 5 times as much animal protein per capita as those in China, Japan 7 times, Taiwan 9 times, and the United States 11 times. Of China's total animal protein consumption in 1995, pork accounted for 50 percent, eggs 17 percent, aquatic products 16 percent, poultry meat 12 percent, beef 3 percent, mutton and goat meat 2 percent, and milk 0.2 percent.

Animal protein consumption has been satisfied primarily from domestic output, which has grown dramatically during the last 10 years. Between 1986 and 1996, China's total animal protein output reportedly tripled, from 38.1 to 118.3 million tons. However, research now underway indicates that China's production was overstated during much of the 1990s and probably had been understated during the 1980s, implying that the reported growth is exaggerated. Nonetheless, there is no doubt that livestock output has grown rapidly in the last decade.

Trade accounts for a very small share of China's consumption of livestock products. In 1996, China exported about 1 percent of its livestock products and imported a similar amount. Government policies have severely limited China's trade in livestock products. A strategy of grain self-sufficiency limited the growth of domestic livestock production in past decades, while a strategy of meat self-sufficiency restricted imports of livestock products. Although it is always difficult to foresee future policy shifts, there is nothing in current livestock-related policy statements to suggest that dramatic changes are in order any time in the near future. Furthermore, China's port, cold storage, food handling, and transportation systems are inadequate to move large quantities of livestock products either into China or out to international markets. Phytosanitary issues, such as foot and mouth disease, are also a constraint on China's pork or pork product exports.

Since the establishment of the People's Republic of China in 1949, government intervention has substantially affected China's animal protein production and consumption. Policies pursued during the Great Leap Forward (1958-60) had a catastrophic effect on agricultural production: Tens of millions of people perished, grain output plummeted, livestock inventory numbers crashed, and animal proteins practically vanished from people's diets. On the other hand, since 1980, reform policies that emphasize market incentives and reduce or limit government intervention have greatly stimulated livestock production.

Livestock products were liberalized first, followed by oilseed products (meals). Grain production and marketing controls continue to this day. Farmers are required to sell a fixed quantity to government-owned grain stations at a fixed quota price. For grain produced beyond this amount, farmers have several options: They can sell any additional grain to the government grain station at market (support) prices, they can sell the grain at local open market prices, or they can feed the grain to livestock and later sell their animals or animal products at local markets. Changes in government grain policies have been a leading factor in the variability of livestock output over the past few decades. This is likely to continue into the next decade.

Driven by a rising concern that China's domestic feed grain and protein meal output may not meet rapidly increasing demand, the government is supporting grain-saving livestock production, particularly by promoting feed-efficient production systems such as poultry, fish, and grass-fed ruminant operations, while reducing support for pork production.

American and Chinese researchers have observed that per capita meat availability as measured by government production and population statistics is larger than per capita meat consumption as measured by urban and rural household income and expenditure surveys (nearly twice as large in 1996). Scholars in China have questioned this growing gap and tried to explain the difference (2). Most researchers agree that some animals slaughtered have been double counted and, in some cases, local cadres inflated output statistics to earn better performance evaluations (1).

China's State Statistical Bureau (SSB) recently began conducting sample surveys on livestock inventories. Results from the surveys and from China's first agricultural census (completed in January 1997) provide useful benchmarks. The SSB confirmed the overreporting in its latest *China's National Economic and Social Development Communiqué*, published on March 5, 1998. The communiqué revised red meat output downward by about 20 percent. The revisions are critical for understanding the current situation in China's animal protein economy and the potential for future agricultural growth. Later this year, ERS plans to publish a Staff Report, *A Review of China's Meat Production Statistics: An Estimation Methodology and an Analysis of the Implications for Trade*, which addresses this issue.

While pork is by far the most important product in China's livestock sector, its importance is declining. Between 1980 and 1996, pork output increased substantially, but not as fast as other meats. Per capita consumption at home increased 63 percent in rural areas but did not increase much in urban

areas. Constraints on feed grain supply are likely to slow future growth of China's pork output. Pork's share of total meat consumption, which fell from 86 percent in 1980 to 76 percent in 1996, is expected to continue declining. The structure of pork production has changed as output has gradually shifted from individual farm households using traditional technology (currently about 80 percent of output) to specialized livestock-producing households and commercial firms using modern technology. The largest potential future gains in feeding efficiency are still to be found in the pork sector.

Poultry production and consumption increased rapidly from 1980 to 1996. As per capita at-home consumption tripled (from 0.76 to 2.44 kilos) in the last 15 years, poultry meat's share in total meat consumption doubled, from 7.2 percent in 1980 to 14.2 percent in 1996. Production growth was stimulated not only by general market-oriented policy reforms, but also by direct government support in such things as specialized poultry breeding operations. Government plans call for continued support of the poultry industry. However, future growth will depend on changes in per capita income and relative prices among competing sources of animal protein. Egg output grew dramatically from 2.6 million tons in 1980 to 19.5 million in 1996, while per capita at-home consumption increased from 2.04 kilos to 5.03 kilos. Growth in poultry and egg output is expected to remain strong, though accelerating less rapidly than in the previous 15 years.

Even though beef production rose sixfold between 1980 and 1996, beef still accounts for only a small share of China's total meat consumption. More efficient use of crop residues in intensive crop growing regions contributed to its rapid growth. But because cattle were treated as a production means and owned collectively in rural areas until the early 1980s, beef consumption was discouraged and limited. Therefore, there was a tendency to underreport beef cattle before the early 1980s, and the apparent sixfold growth in beef production statistics may overstate actual growth over the last decade. Beef's share of total meat consumption rose from 2.5 percent in 1980 to 5 percent in 1996, as per capita at-home consumption tripled. Although the expansion of more efficient feeding practices (particularly the use of ammoniated feed) is expected to boost output in the coming decade, beef output is likely to increase more slowly than in the past because of consumer preferences, rising prices, and slower income growth.

Mutton and goat meat output more than quadrupled from 1980 to 1996, and its share of total meat consumption rose from 4.2 percent in 1980 to 4.4 percent in 1996. A large part of the increase came from expansion in intensively cropped areas in eastern China. Per capita at-home consumption doubled from 0.4 kilos per person in 1980 to 0.9 kilos in 1996. In the coming decade, government policies supporting more efficient feeding with crop residues can be expected to continue to stimulate production in intensively cropped areas.

Dairy output expanded from 1.4 million tons in 1980 to 7.4 million in 1996. Tightening feed grain supplies over the next decade are likely to reduce the rate of growth. China's consumers do not have a long or well established tradition of consuming dairy products. A portion of domestic demand for dairy products such as non-fat dry powdered milk will likely be met through imports.

Aquatic product output rose from 4.5 million tons in 1980 to 32.9 million in 1996, accounting for the most rapid growth among all animal protein products, and making China the world's largest producer. But per capita at-home consumption levels are still low, despite increasing from 1.8 kilos in 1980 to 4.6 kilos in 1996. Prospects for the coming decade are mixed. While the government has invested heavily in equipment to increase the ocean catch, world fish resources appear to be declining and traditional fishing nations are becoming increasingly conscious of overfishing and damage to marine ecosystems. China's authorities would like to expand domestic aquaculture systems because fish are very efficient converters of grain and oilseed meals to meat. However, water shortages in North China and environmental problems in South China pose constraints to continued rapid expansion. Overall we expect only moderate output growth over the coming decade.

Areas for Further Research

The articles published in this issue of *China: International Agricultural Trade Report* attempt to collect and organize some of the basic information needed to understand China's livestock economy. They are early steps in a process of data collection and analysis to support a research program on topics of particular relevance to U.S. agriculture. Our initial findings suggest several important issues that merit additional investigation.

- To project the future of China's livestock production, one must understand the factors influencing structural change in the livestock sector, changes in feeding practices, and differences in feed/meat conversion rates across types of producers and across regions. Livestock output grew relatively slowly from 1955 to 1980 because of a series of government policies that constrained production. Beginning in 1980, market-oriented and incentive-based economic policy reforms were introduced, setting off a period of unusually rapid growth. However, this was an unsustainable, one-time spurt in output due to fundamental structural changes. Future output growth will be influenced not only by changes in government policies, but also by economic and technical factors.
- Two-thirds of China's population still lives in rural areas. With a large gap between rural and urban incomes, household consumption levels and patterns vary markedly across the country. Rural per capita animal protein consumption is about one-third that of urban areas. Rural households consume mostly self-produced products,

while urban households purchase all of their meat. China's economic development, especially the speed of urbanization, will continue to affect the quantity and patterns of China's animal protein consumption. To better understand structural change in consumption, elasticities of demand need to be differentiated by product and by place of residency.

Furthermore, as incomes rise, restaurant consumption is growing rapidly. China's household consumption and expenditure surveys, however, do not fully cover away-from-home consumption. It may be estimated by examining the differences between per capita protein availability stemming from output data and per capita consumption data coming from SSB household surveys, though comparisons of data drawn from different agencies are fraught with statistical perils. A more reliable approach might be to measure restaurant purchases of foodstuffs. ERS has research underway on this topic (1).

- China's trade policies related to animal proteins are changing. Important questions in this area include: What are the likely future changes in meat exports and imports? To what extent will authorities hold to self-sufficiency policies? Might authorities maintain self-sufficiency for some products, such as pork, but liberalize the trade of other products, such as fish or poultry? And finally, what policy instruments will China use to support those products?

- The rapid development of China's livestock sector over the last two decades has been largely attributable to government policies, particularly the liberalization of the livestock sector since 1985. Future development of this sector is likely to be affected by further liberalization in the oilseed and grain sectors. Thus, changes in government policies related to these two sectors, particularly grains, need to be studied closely. For instance, the new grain distribution reform instituted this year and the 3-year-old governor's grain bag responsibility system will affect the availability and marketing of grains for feed, and therefore will influence livestock production.

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Appendix A: China Well Behind Neighbors in Animal Protein Consumption

China is the world's most populous country with 1.236 billion people. This means that even with very large aggregate animal production numbers, per capita consumption is quite modest. To compare animal protein consumption in China with patterns in other countries, the quantities of animal proteins consumed were converted to a protein weight basis.¹ This places all animal products on the same basis so one is not comparing a kilogram of pork with a kilogram of eggs and milk.

On a per capita basis, China's animal protein consumption is well below that of the United States, Japan, Korea and Taiwan (fig. A-1). Elsewhere, ERS has published analyses suggesting that China's per capita red meat availability paralleled that of Japan (see AIB No. 730). But when we re-examined the situation from the point of view of per capita consumption of animal proteins, we found that there was a

great gap between China and its neighbors. Consumers in Japan eat 7.4 times as much animal proteins as those in China; Taiwan, 8.7 times, South Korea, 5.4 times, and the United States, 10.8 times.

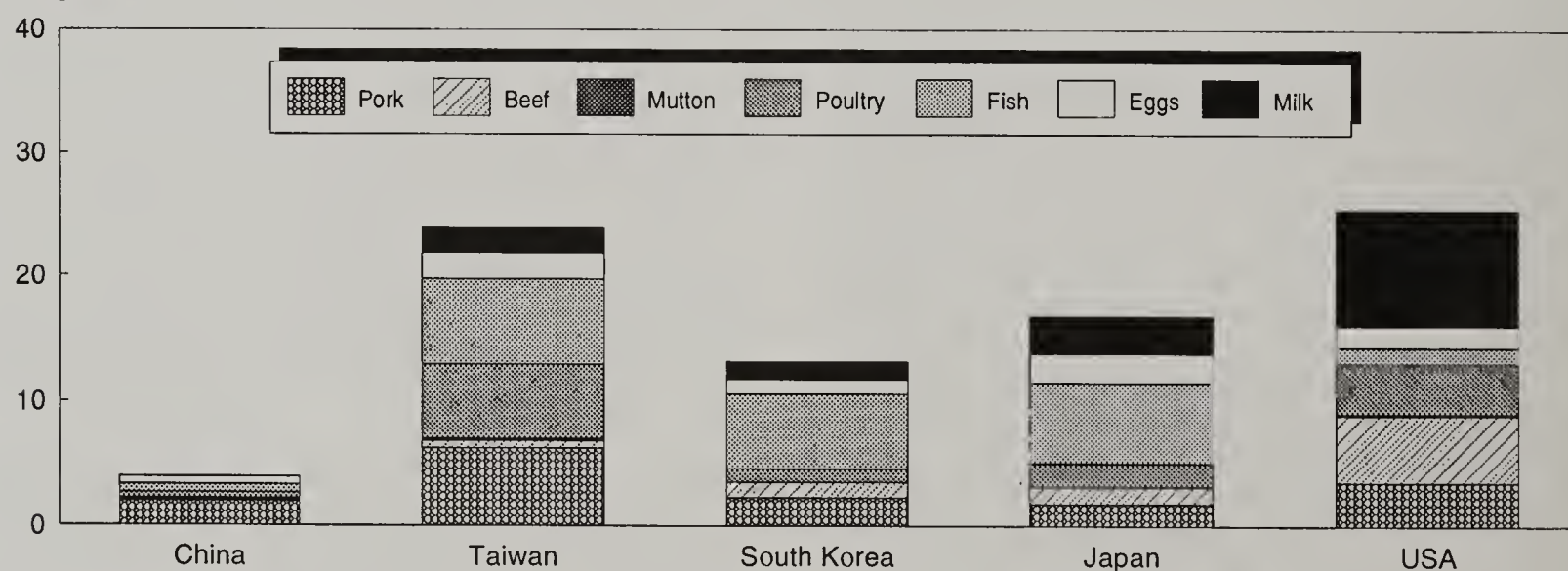
If China's economy continues to expand and per capita incomes rise, one could project that per capita animal protein consumption could increase. Even if per capita consumption in China increases to half the Japanese level, demand for feedstuffs or animal product imports would rise sharply. The increased demand for feedstuffs could be met by expanding domestic output or increasing imports, or by importing more animal products. From a national security point of view and from an economic development point of view, China's leaders may choose policies to expand per capita animal protein to improve the nutritional content of the average diet. At the same time, they may decide not to go beyond a certain level that would use up unacceptable levels of foreign exchange earnings for animal proteins and that might endanger the health of citizens.

¹The conversion used USDA factors published in Agricultural Handbook No. 8, *Composition of Foods*.

Figure A-1

Per Capita Consumption of Animal Protein: Meat, Eggs, and Milk, 1995

Kilograms



Source: USDA/ERS/MTED data base.

Appendix B: The Effects of Government Policies on Animal Protein Production and Consumption

Officials in the USSR, Eastern Europe, and China fixed grain prices at low levels and adjusted the terms of trade between rural and urban sectors to extract capital from rural areas to build industry. Officials also provided urban residents with subsidies for housing, medical care, education, and transportation. Urban consumers therefore had more disposable income to spend on food items, such as meat, than would otherwise have been the case. Urban residents in the USSR and Eastern Europe developed meat consumption patterns in which per capita consumption was higher than would have been the case in an undistorted open market situation. These policies have been referred to as “cheap grain” policies (i.e., cheap grain for urban residents). When central planning ended in the USSR and in Eastern Europe, and market prices began to drive economic decisions, animal inventory numbers plummeted, animal protein output decreased, and per capita consumption fell.

China partially followed the “Soviet” model, albeit with a vastly different resource base. The USSR had a better man/arable land ratio, a smaller agricultural labor force (and demand for industrial workers), and higher per capita grain availability than China. China extracted from the agricultural sector and constructed policies to subsidize urban development and industrialization, but it did not try to move the labor force from rural to urban areas. On the contrary, China’s officials tried to keep people on the farms. Urban and rural market activity was limited. How did these policies affect China’s animal protein production and consumption over the past four decades?

1955-1977—The Period of Central Planning: Tax Agriculture and Build Industry

The period was generally one of grain shortages and citizens had rather modest quantities of grain per capita. Officials instituted government purchase of grain from producers and rationed grains to urban residents. Urban and rural market activity was limited in this period. Farmers were organized into collective farms and communes. Grain and animal proteins were not produced by individual farm households but by collectivized units. Government grain, economic, and political policies created a great chasm between animal protein consumption levels, with urban residents consuming twice as much animal proteins as their rural cousins. Compared with her neighbors, however, China’s citizens on average consumed rather modest amounts of animal proteins (see fig. A-1).

The Effect of These Policies on Animal Protein Producers

Producers of animal protein for urban residents: Low-priced grains were transferred from rural areas to urban

areas. Animal proteins were produced in rural and suburban areas and producers were forced to sell their products at relatively low prices.

During 1955 to 1961, the policies had a negative effect on protein producers. But during 1962-1964, protein producers were given low-priced grain and other subsidies, providing they sold their products to the government.

During the Cultural Revolution (1965-1975), private plots and open markets were closed, and cadres stressed regional self-sufficiency. Policies varied by province. Some implemented policies that had a negative effect on protein producers, while others instituted policies that encouraged protein production for urban residents.

Producers of animal proteins for rural residents: Animal proteins were produced by collective farm livestock teams (which produced pork, beef, dairy, fish, and mutton) and by individual households (backyard operations for pork and poultry). Most animal products had to be sold to government food distribution companies. For most of this period individual households did not have access to feedstuffs to produce animal proteins.

The state transferred grain away from rural areas, which had a negative effect on protein producers for rural residents. Rural producers did not get subsidized grain to produce meat for their own consumption. Most rural producers had to rely on their own grain output. Farmers had to meet government hog quotas, which implied they had to sell their hogs to the government at very low prices. These policies hurt farmer incentives to produce meat.

During the brief period from 1962 to 1964, rural households were allowed to have private plots and to produce animal proteins for local open markets. Policies in this period had a positive effect on rural animal protein producers.

The Effect of These Policies on Consumers

Urban consumers of animal proteins: Cheap grain yielded relatively cheap meat, demand at low prices exceeded supplies, and prices were not allowed to rise, so meat was rationed. Because of limited supplies, only small quantities of animal proteins were rationed to urban residents. For example, in 1955 per capita urban pork consumption was 9.7 kilograms per year. Consumption fell to only 1.7 kilos during the “Great Leap Forward” period (1958-1961) and did not regain the 1955 level until 1964. In this period, urban residents had higher per capita consumption levels

than those in rural areas, but low consumption compared with the rest of the world.

Rural consumers of animal proteins: Grain was transferred out of the rural areas at below market prices. Incomes, per capita grain availability, and per capita meat consumption were low. For example, pork consumption for rural consumers increased from 5.5 kilos in 1952 to only 6.1 kilos in 1977. In 1961, rural per capita pork consumption fell to 1.3 kilograms (see fig. A-2 for rapid per capita increase from 1961 to 1966).

1978-1984: The Revival of Family Farms And Markets

In this period the central government retained central planning of the economy, continued to tax its rural sector, and continued to require farmers to sell grain to the state at low fixed quota prices. What did change in this period was that family farms were allowed to take the place of collective farms. Families could pursue profit-maximizing strategies once they had fulfilled grain and animal protein quotas. At the same time, farmers could sell their above-quota products in open rural and urban markets. Grain production increased from 282 million tons in 1977 to 407 million in 1984.

The Effect of These Policies on Animal Protein Producers

Producers of animal protein for urban residents: Producers were given bonuses (low-priced fertilizer) and low-priced grain to produce animal proteins to meet the government's production quotas. After fulfilling government-mandated purchase quotas, farmers were able to sell products at a "negotiating" price to the government-controlled commercial system. The negotiating price was 30-50 percent higher than the quota price. In the late years of this period, farmers

were also able to sell part of their products in open markets. Output of animal protein products increased dramatically in this period.

Producers of animal proteins for rural residents: After meeting government grain procurement quotas, farm families could allocate their unused grain as they wished. Many fed their own grain to animals, which boosted protein output. Farmers were free to sell their protein products in open markets and to government-owned food firms.

The Effect of These Policies on Consumers

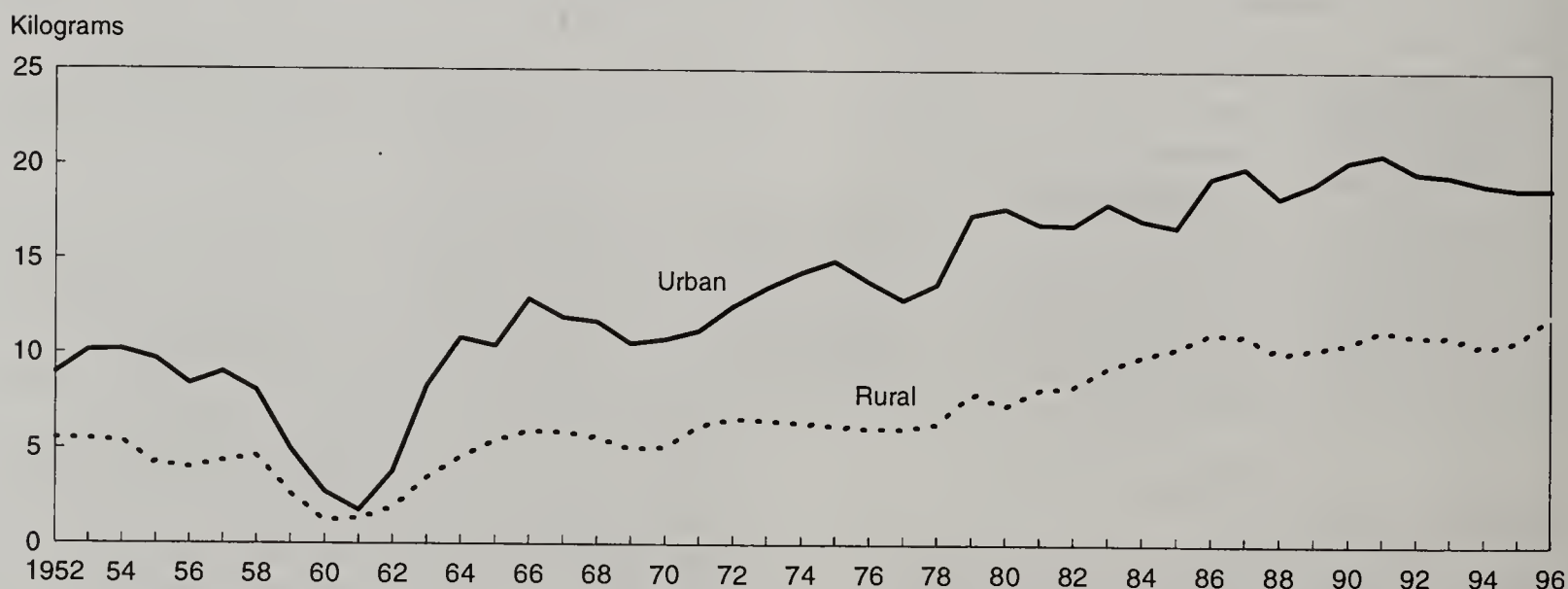
Urban consumers of animal proteins: Urban commercial departments did not raise retail prices for within-quota animal proteins, but were allowed to sell negotiating-price animal proteins to urban consumers. As consumers were able to purchase negotiating-price goods as well as market-price goods in local open markets, government subsidies in consumers' total consumption fell significantly. With more available supply, consumption of animal proteins rose. For example, urban per capita pork consumption rose from 13.7 kilograms in 1978 to 17.1 kilos in 1984.

Rural consumers of animal proteins: State-procured grain continued to be transferred from rural to urban areas at low prices. But increasing grain output left more grain in rural areas. Protein producers were free to sell their goods in local open markets. Rural per capita pork consumption rose from 6.1 kilograms in 1977 to 9.9 kilos in 1984.

1985-1991: Market Prices for Animal Protein Products

The proportion of the economy controlled by the central government contracted, while the rural sectors were continuously taxed, as farmers were still required to sell part of

Figure A-2
Urban and Rural Per Capita Pork Consumption



Source: China State Statistical Bureau.

their grain production to the state at low fixed-quota prices. With the eventual elimination of animal protein product quotas in this period, the government eliminated the subsidies for feed and other inputs for animal proteins. Most of the products were traded either at negotiating prices or at open market prices. Grain production rose from 379 million tons in 1985 to 435 million in 1991.

The Effect of These Policies on Animal Protein Producers

Producers of animal protein for urban residents: Increasing grain output supported growth of protein production. Urban demand continued to rise as incomes rose and as residents continued to satisfy their pent-up demand for more protein. There were, however, periods of oversupply and falling market prices followed by tight supplies and rising prices.

Producers of animal proteins for rural residents: After meeting government grain procurement quotas, farm families could allocate their unused grain as they wished. Many fed their own grain to animals but there was not a great upsurge in protein output. Families were free to sell their protein products in local open markets.

The Effect of These Policies on Consumers

Urban consumers of animal proteins: Urban consumers lost their subsidies on animal proteins on a product-by-product basis. But in 1988, urbanites received lump subsidies in lieu of the subsidies on products to help them purchase animal proteins at open market prices. Per capita urban pork consumption increased from 16.8 kilograms in 1985 to 20.6 kilos in 1991 (see fig. A-2).

Animal protein supplies became irregular with swings between feast and famine that set the stage in for the “food basket” program in the next period.

Rural consumers of animal proteins: State-procured grain continued to be transferred from rural to urban areas at low prices. But increasing grain output left more grain in rural areas. Consumers were able to purchase animal protein products in local open markets. Per capita rural pork consumption rose from 10.3 kilograms in 1985 to 11.3 kilos in 1991.

1992-1998: Rising Government Grain Procurement Prices

The central government relaxed central planning regimes in the economy. It continued to require farmers to sell grain to the state but raised the fixed quota price and began to use market prices to purchase grains. The government began to decrease its subsidies for urban residents who had to pay an increasing portion of their rent, education, health care, and transportation. An increasing portion of goods were traded in open markets. Grain production rose from 442 million tons in 1992 to 493 million in 1997.

The Effect of These Policies on Animal Protein Producers

Producers of animal protein for urban residents: Because of fluctuations in animal protein supplies in the previous period, the government urged municipal governments to sponsor “food basket” programs in which local governments funded food production through subsidies and direct government investment. Suburban and rural producers were pressured to increase supplies of vegetables, fruits, meat, eggs, and milk. The programs had a positive effect on the output of animal protein.

Government leaders became concerned about the general level of grain output, grain self-sufficiency, grain stocks, and grain imports and exports in 1994. They promoted the “governor’s grain bag responsibility” system in which the government used administrative pressures and direct government investment to boost grain production in 1995, 1996, and 1997. This program boosted grain supplies such that grain prices generally fell, imports were reduced, and grain stocks increased. The abundant supplies have had a positive effect on protein producers.

Producers of animal proteins for rural residents: In some years grain was transferred from the rural areas to urban areas at below market prices. This had a negative effect on rural protein producers. On the other hand, in some years the oversupply of grain in rural areas lowered feed prices, which had a positive effect on rural protein producers.

The Effect of These Policies on Consumers

Urban consumers of animal proteins: The rising grain and feed prices boosted animal protein prices and these price increases have had a negative effect on consumption. For example, per capita urban pork consumption fell from 19.7 kilograms in 1992 to 18.9 kilograms in 1996.

Rural consumers of animal proteins: Per capita rural pork consumption rose from 11 kilograms in 1992 to 12.2 kilograms in 1996. Perhaps income effects are still stronger than price effects in rural areas.

Policy Implementation

Authors of the above articles describe policy measures with respect to particular animal proteins, but how policies were actually implemented is often not clear. In centrally planned economies, such as China, government (and Party) officials issue administrative orders and grants, approve low interest loans, and approve or reject applications for new enterprises. Hence, while analysts can describe policies, note changes in policy directions, and examine statistical data that demonstrate policy fulfillment, it is very difficult to observe and understand how authorities and local cadres actually implement policy.

Appendix C: China's Feed Industry

Feed grains used in livestock production have changed significantly since the 1980s. Increased corn output and the development of China's feed industry improved feed quantity and quality. Corn production has grown rapidly since the mid-eighties. The crop is now largely fed to livestock, with only a small portion still being used in human food consumption, mainly in poor or low income rural areas. The feed industry also began to expand since the mid-1980s. In

the early 1980s, total compound feed output was only about 5 million tons, roughly 10 percent of the total amount of grains fed to livestock at that time. In 1996, the feed industry produced 51 million tons of compound and mixed feed (table A-1).

Because of the different types of feeding operations in China and because the dominant share of output comes from hundreds of millions of households, there are no official surveys and no official data on the type and quantity of feed-stuffs used. A study of China's livestock sector was completed in 1997 by the Research Center for Rural Economy (RCRE), China's Ministry of Agriculture. The study, with the collaboration of the University of Arkansas, Iowa State University, and the Economic Research Service includes a survey on feed use.

Authors of individual articles in this report have been referenced as it pertains to the animal protein under discussion. Table A-2 summarizes data regarding the types of commodities used by different classes of producers. Specialized households and modern enterprises use more formula feeds while backyard producers use more ground grain, vegetables, table scraps, and green fodder.

Table A-1--Feed production in China, 1982-96

Year	Compound and mixed feed	Concentrate feed	Feed additives
Million tons			
1982	5.10	na	na
1985	15.00	na	na
1991	32.00	na	na
1992	34.94	0.59	0.30
1993	43.00	2.00	0.50
1994	39.50	2.00	0.50
1995	45.00	2.60	0.70
1996	51.00	3.80	0.75

na = Not available.

Source: China's Agricultural Statistical Yearbooks, various issues

Table A-2--China's feed use by commodity and producer class, 1997

Type of feed	Pork			Beef		Mutton	Poultry	Eggs
	Backyard	Specialized household	Modern enterprise	Backyard	Specialized household	Specialized household	Specialized household	Specialized household
Percent of total feed								
Grain	41.2	38.5	0.0	35.9	39.6	14.4	20.9	33.9
Formula feed	8.6	34.6	100.0	0.0	0.2	2.5	69.7	52.3
Oilseed meal	1.4	6.9	0.0	2.1	8.5	0.8	7.2	6.2
Bran	26.9	14.0	0.0	6.3	5.7	2.5	0.2	4.2
Concentrate mixes	0.6	3.5	0.0	0.0	0.4	3.8	1.9	1.9
Fish meal	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.5
Byproducts	1.9	2.6	0.0	7.0	13.8	0.0	0.0	0.0
Grass/fodder	18.5	0.0	0.0	48.6	31.4	76.1	0.0	0.0
Total feed	99.1	100.1	100.0	99.9	99.6	100.1	100.0	100.0

Source: Zhang Xiaohui, Cao Liqun, Chen Hansheng, Wu Zhigang, Guo Jianjun, Eric J. Wailes, Cheng Fang, China's Livestock Feed Use Relationships: Preliminary Results from a Survey in Seven Provinces.

Appendix D: Glossary of Terms

As might be expected, China's rural economy is organized on a much different basis from that in the United States. To help readers more quickly understand some of the terms used in the articles above, we have put together this brief glossary of terms.

<i>Ammoniated feed</i>	Crop residues with high-cellulose content are sealed in a container (silo), and either anhydrous gas or liquid ammonia is added. This method increases crude protein and digestible nutrients in feed for bovine animals such as cattle and sheep.
<i>Category I Products</i>	During the First Five Year Plan period (1953-1957, see appendix B) the government gained control over the marketing of all major economic commodities. Authorities classified all goods into three categories. Commodities of great importance to consumers and products controlled by the State Council in the "planned purchase and planned supply system" (government purchase and rationing) such as wheat, rice, corn, soybeans, and cotton, were classified as category I items. The government placed tight controls on category I products for both the domestic market and for imports and exports.
<i>Category II Products</i>	Products grown in concentrated areas (hemp and walnuts) and commodities important for export (eggs and tea) which are controlled by the State Council or various Ministries, are considered category II products. From 1953 to the mid-1980s many livestock products were included in category II: pigs, cattle, eggs, and fish.
<i>Category III Products</i>	Goods not classified as I or II were by definition assigned to category III. During the economic reforms beginning in 1980, an increasing number of goods have been reclassified, shifting from category I to II and from II to III.
<i>CFCR</i>	Concentrate feed conversion ratio—a ratio of the amount of concentrate fed to net live weight gains or output (eggs).
<i>FAO</i>	Food and Agriculture Organization of the United Nations.
<i>FCR</i>	Feed conversion ratio—a ratio of total feed consumption, including concentrates and roughage, to net live weight gains.
<i>FGCR</i>	Feed grain conversion ratio—a ratio of kilograms of grains only, which include corn, sorghum, wheat, rice, barley, and potatoes (grain equivalent weight) to net live weight gains or output.
<i>Food basket</i>	In 1989 mayors of large and medium sized cities implemented the "food basket" (referred to in Chinese as <i>cai lan zi</i> or vegetable basket). Municipal governments sought to boost local supplies of non-grain foods such as fruits, vegetables, and animal protein products such as pork, beef, mutton, poultry meat, fish, eggs, and dairy products. Local governments provided a wide range of support such as price subsidies, technical extension, transportation, and marketing services.
<i>MIT</i>	Ministry of Internal Trade.
<i>Modern operations</i>	These large-scale livestock enterprises are often located near large urban centers, use large-scale operations, use formula feeds, and employ modern feeding technologies. In some cases they are associated with foreign joint ventures, which include breeding stock, feed mills, processing plants and retail outlets.
<i>RMB</i>	Ren Min Bi, or yuan, is China's currency and in 1997 8.3 RMB equaled one US\$ 1.00.

<i>Specialized households</i>	These entities concentrate most of their effort and time to produce one kind of livestock product and derive most of their income from that activity. For example, one specialized household might raise 500 to 1,000 broilers or 20 to 50 hogs.
<i>SSB</i>	State Statistical Bureau.
<i>Townships</i>	Townships, villages, and family farms replaced the old communes, brigades, and production teams. Before 1980, most animal protein commodities were produced either by state and collectively owned entities or by individual households. Three entities have produced most animal protein products since 1980: households, specialized households, and modern operations.
<i>Traditional households</i>	Sometimes referred to as backyard operations, these households continue to produce large quantities of livestock products. Many traditional farm households typically raise 1 to 4 hogs and have 5 to 10 chickens on their farmsteads.

Appendix E: Factors Affecting Future Demand and Supply of Animal Protein Products

China's population growth rate is projected to slow from 1.0 percent in 1996 to 0.7 percent in 2005. A shift from rural to urban centers is also anticipated in the next few decades.

While income elasticities for animal protein products are lower in urban areas than in rural areas, urban consumption patterns also suggest that urbanites generally consume more animal products than rural residents. The growth in population and shifts in where residents dwell likely will stimulate demand for animal products.

China's gross domestic product increased rapidly in the last decade. This growth rate is expected to slow in the coming decade from 10 percent in 1996 to 8.4 percent 2000-2005, but most economic forecasts continue to see positive growth despite the current problems in South and East Asian economies. This positive stream of income will encourage consumption of more animal products.

Pork is currently the preferred meat in China. But if China is not able to increase grain and oilseed production to meet domestic feed requirements, the price for pork may rise because hogs are less efficient converters of feed into meat compared with poultry, fish, and grass-fed bovine animals. A relative increase in the pork price vis-a-vis other animal protein products may induce consumers to switch to other products.

Currently China is not a major importer of animal products. But in the next decade China may look to international markets for alternative sources of supplies. Certainly a rise in international market prices for animal protein products such as non-fat dry milk would have a dampening effect on China's future purchases. On the other hand, foreign demand for some of China's animal products such as fish,

pork, and poultry cuts would support continued growth of those industries.

China is preparing to join the World Trade Organization (WTO), and meat trade issues have been discussed in China. Unlike most crop sectors, all of China's meat products except poultry meat have a price advantage over the world market. For example, based on a calculated average of the base period for concessions and an assumed comparable average grade, the price of sheep/goat meat in China is 54 percent lower than on the world market (Feng, 1997).

China's analysts see the comparative advantage of lower meat product prices than those in neighboring countries. They also see benefits in exporting meat products. China supports a trade strategy of "having two ends abroad" with respect to meat production. This strategy allows the import of a portion of animal feeds to be transformed internally into value-added meat products, which then will be exported to the world market. China is continuing to strengthen markets in Hong Kong and Macao, and it is looking into opportunities to increase sales to neighboring Japan, the New Independent States of the former Soviet Union, Indonesia, and the Middle East.

Several USDA studies of China's agricultural economy from 2005 to 2025 forecast that production of feed grains and oilseed meals will increase through time, but the demand for feed and oilmeals will outpace supplies, and the supply/demand gap will widen. With increasing tightness in domestic feed grain and oilmeal supplies one should expect producers to implement efficiency measures to save on scarce feed supplies. One of the strategies already in place and supported by government programs is to accelerate the growth of the poultry, aquatic, and grass-fed bovine animal industries.

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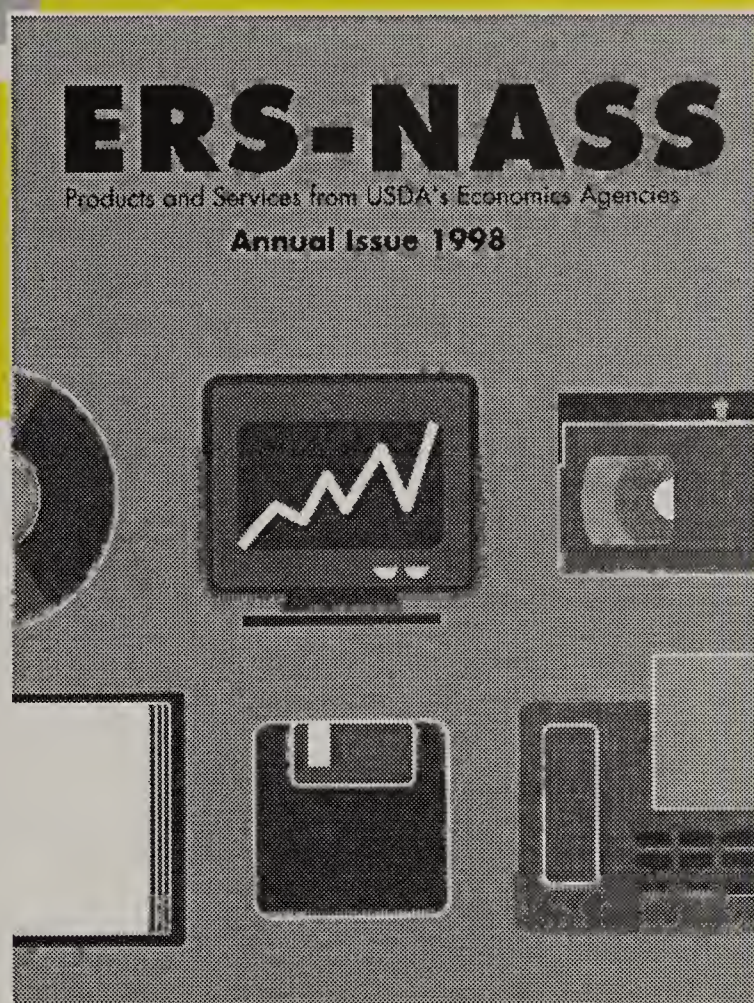
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